GRANT APPLICATION MANUAL

PIER ENVIRONMENTAL AREA GLOBAL CLIMATE CHANGE GRANT PROGRAM

May 2003

PUBLIC INTEREST ENERGY RESEARCH

"Research Powers the Future"

PIER[1] ENVIRONMENTAL AREA
GLOBAL CLIMATE CHANGE GRANT SOLICITATION NO. CIEE-GCC-2003-1

DEADLINE FOR RECEIPT OF APPLICATIONS:
5:00 PM PDT, July 31, 2003

The California Energy Commission's (Commission) PIER Environmental Area (PIER-EA) Team is requesting proposals for research projects through its Global Climate Change (GCC) Grant Program. This program is administered through the University of California. The goal of this program is to complement the research activities undertaken at the University of California at Berkeley and at San Diego (Scripps) aimed at implementing the PIER-EA Climate Change Research Plan. This Grant Program, together with core research activities at the aforementioned universities, forms the basic structure of the California Climate Change Research Center. The overall objective of this Center is to advance our understanding of the potential impacts of a changing climate on California, its citizens, economy, and ecology.

The PIER program is made up of six subject areas: Buildings End-Use Efficiency, Industrial/Agricultural/Water End-Use Energy Efficiency, Renewable Energy, Environmentally-Preferred Advanced Generation, Energy Systems Integration, and Energy-Related Environmental Research. The stated mission of the PIER Program is to conduct energy research to improve quality of life by "…providing environmentally sound, safe, reliable and affordable energy services and products…".

In practice, the mission of the PIER-EA program is to develop cost-effective approaches to evaluating and resolving environmental effects of energy production, delivery, and use in California, and to explore how new electricity applications and products can solve environmental problems. In the context of this mission, there are three primary reasons for a major PIER-EA research effort on climate change. First, electricity generation in (or for import into) California is a major source of greenhouse gas (GHG) emissions. Second, there is a high likelihood that higher temperatures attributable to climate change will increase energy consumption—and particularly electricity consumption—in California. Third, by altering precipitation patterns across the West, climate change is likely to affect the supply and cost of hydropower, which represents about 20% of in-state electricity generation. Thus, it is necessary for PIER-EA to study both how to mitigate the climate-related effects of electricity generation and how to maintain reliable and affordable flows of electricity to California's households and businesses in the context of a changing regional climate

The primary objective of this solicitation is to select proposals that will best address the four research topics described in Attachments RT1 through RT4.

[1] The Public Interest Energy Research (PIER) Program is managed by the California Energy Commission. The purpose of the program is to provide benefits to California electric ratepayers by funding energy research, development and demonstration (RD&D) projects that are not adequately provided for by competitive and regulated energy markets. More information about the PIER Program can be found at www.energy.ca.gov/pier/energy/index.html.

Grant awards will be made competitively on the basis of a technical and programmatic review process, found in Section 2.1 of this Grant Application Manual. A total of $1,200,000 is expected to be available for work under this solicitation, with awards ranging from $100,000 to $600,000.

A detailed description of the PIER-EA program and the Global Climate Change program can be found on the Commission web site at: www.energy.ca.gov/pier/energy/index.html.

Participation in the PIER-EA Global Climate Change Grant program is open to individuals and the following groups: individuals, small and large businesses, non-profit organizations, academic institutions, and local, state and federal governmental organizations. To encourage participation in the program, the process for soliciting, evaluating and awarding grants has been simplified and streamlined.

Persons interested in applying for a PIER-EA Global Climate Change Grant should consult the material in this Grant Application Manual. The Grant Application Manual contains important details on the preparation and submission of proposals, including instructions that must be followed and forms that must be used.

Submit completed grant applications to appropriate address below.

Address for electronic submission (PREFERRED):

Email: Gccgrant@energy.state.ca.us

PIER-EA Global Climate Change Grant Program Administrator
California Institute for Energy Efficiency
University of California, Office of the President
1333 Broadway, Suite 240
Oakland, CA 94612-1918

Contact Information
Contact: John Snyder
Phone: (510) 287-3322
Fax: (510) 287-3328
Email: Gccgrant@energy.state.ca.us

Note: **Proposals sent to the California Energy Commission will not be accepted.**

Applicant Notification List

We recommend that all individuals or organizations that intend to submit a proposal to the current solicitation register their email address with the PIER-EA Global Climate Change Grant Program Administrator (GCC Administrator). To register, send an email to Gccgrants@energy.state.ca.us and request your email address be added to the

"Applicant Notification List". Contact information will only be retained for the current solicitation and must be renewed for each solicitation to which you intend to apply.

Global Climate Change Grant Solicitation Notification

Individuals and organizations that desire to receive an email notification of future PIER-EA Global Climate Change Grant solicitations or all Commission funding solicitations should go to the California Energy Commission's web site at www.energy.ca.gov/contracts and go to the page describing the various Mailing Lists. Follow the instructions for registering your email address with Research and Development Lists.

The GCC Administrator and staff welcome your comments and suggestions for improving this manual at any time. Please contact us if you have any questions or comments about these materials.

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LIST OF ATTACHMENTS

OVERVIEW OF THE GRANT APPLICATION MANUAL

This manual provides the information needed to establish applicant eligibility and to complete the application package, and describes the key program features.

Part 1 answers commonly asked questions about the program;
Part 2 contains additional information regarding program features and requirements;
Part 3 includes the application forms and instructions for applying for grant funding; and
Part 4 contains information pertinent to the Grant Agreement.

This manual may be revised periodically to address changes to the grant application process. Applicants must use the current version of the Grant Application Manual that is posted, along with the solicitation, on the California Energy Commission's web site at www.energy.ca.gov/contracts, where it is available for viewing and downloading in both PDF and Microsoft Word 97/98 format. A paper copy of this manual is available from the GCC Administrator upon request (see page iii for contact information).

Part 1. COMMONLY ASKED QUESTIONS ABOUT THE PIER-EA GLOBAL CLIMATE CHANGE GRANT PROGRAM

Who can apply for grants?

Participation in the PIER-EA Global Climate Change Grant program is open to the following groups:

1. **Individuals:** Must be acting independently. If employed or affiliated with an organization, applicant must have authorization from the organization to pursue project development exclusively as an individual with no rights reserved to the organization. The individual, not the organization, retains all intellectual property rights accrued from the grant project. NOTE: Applicants who are employed by a college/university or affiliated laboratory are not eligible to apply as individuals; submissions ***must*** be made through the applicant's home institution.
2. **Small and large businesses:** The PIER-EA Global Climate Change Grant Program uses the Federal definition of small as specified in Title 13, Code of Federal Regulations, Part 121 (13 CFR § 121), Small Business Size Regulations (http://www.sba.gov/regulations/siccodes/). Size requirement for small businesses varies based on type of business with the average requirement being either prior year gross receipts of less than $5 million or total employees not exceeding 500.
3. **Non-profit organizations:** Possess IRS tax exemption.
4. **Academic institutions:** Public or private post-secondary institutions.
5. **Local, State and Federal governmental organizations**: Local, State and Federal governmental agencies, Federal laboratories or other Federally Funded Research and Development Centers who are not otherwise prohibited from directly responding to a public Request For Proposals (RFP).

Are matching funds, cost sharing, royalty payments, or grant repayments required?

Matching funds and cost sharing are strongly encouraged, but they are not required. Applicants will be scored on their ability to bring in matching funds and cost sharing, as well as how they clearly identify plans for obtaining new funds to supplement the proposal. No royalty payments or grant repayments are required.

What projects are eligible for funding?

Proposals must meet **all** of the following criteria to be eligible for consideration under the Grant Program:

1. Proposal was received on time.
2. Proposal is not marked proprietary in its entirety.
3. Proposal is submitted by an eligible applicant.
4. Proposed research does not duplicate existing research.

5. Proposal is complete, does not exceed the maximum page requirement, and is submitted as required in Part 3 Grant Application Instructions.
6. Proposal does not request more than the maximum amount.
7. Proposed research clearly responds to the solicitation.

How much funding is available for the program and for my proposed project?

A total of $1,200,000 is expected to be available for work under this solicitation. The maximum amount you may propose varies with the Research Topic addressed:

- Research Topic 1, Protocol for the Inter-comparison of Regional Climate Models for California: $100,000 (one year maximum duration)
- Research Topic 2, Enhanced Climate and Hydrological Monitoring for California: $400,000 (5-year maximum duration)
- Research Topic 3, Decision Analysis under Risk and Uncertainty for Climate Change and Greenhouse Gas Policy in California: $100,000 (1-year maximum duration)
- Research Topic 4, Dynamic Ecosystem Modeling for California: $600,000 (3-year maximum duration)

When can I apply and how are grant applications processed?

Applicants must submit proposals so that they reach the GCC Administrator between the time a Solicitation Notice is posted on the program's solicitation web page and the proposal cutoff date specified in the solicitation. Grant applications received by the GCC Administrator before 5 PM PDT on the cutoff date will proceed to initial screening as shown in Diagram 1, which depicts the selection process. **Electronic submissions are preferred**.

How long does it take to receive funding?

It takes approximately five to seven months after the cutoff date to complete the proposal evaluation, approval and agreement execution process. Grant agreements may be in place with Awardees within four weeks of the Commission final approval of proposal funding if no unexpected delays are encountered. Research may begin as soon as the grant agreement is fully executed by the GCC Administrator.

Are the selected proposals going to be part of the California Climate Center?

Yes, the selected proposals will be part of the research activities of the California Climate Change Center (Center). For this reason, at least one of the principal investigators must participate twice a year in an informal conference in California where the different researchers will present the status of their research and exchange ideas in order to coordinate their respective research activities, as needed.

How many proposals can a qualified applicant submit?

Only one proposal per research topic as identified in Research Topics 1-4 for a maximum of 4 proposals. If submitting multiple proposals, each application must be a distinct, stand alone proposal. In Form A – Item B - indicate the number of the research topic which applies to the proposal.

Whom do I contact for more information?

PIER-EA Global Climate Change Grant Program Administrator
California Institute for Energy Efficiency
University of California, Office of the President
1333 Broadway, Suite 240
Oakland, CA 94612-1918
Contact: John Snyder
Phone: (510) 287-3322
Fax:(510) 287-3328
Email: Gccgrants@energy.state.ca.us

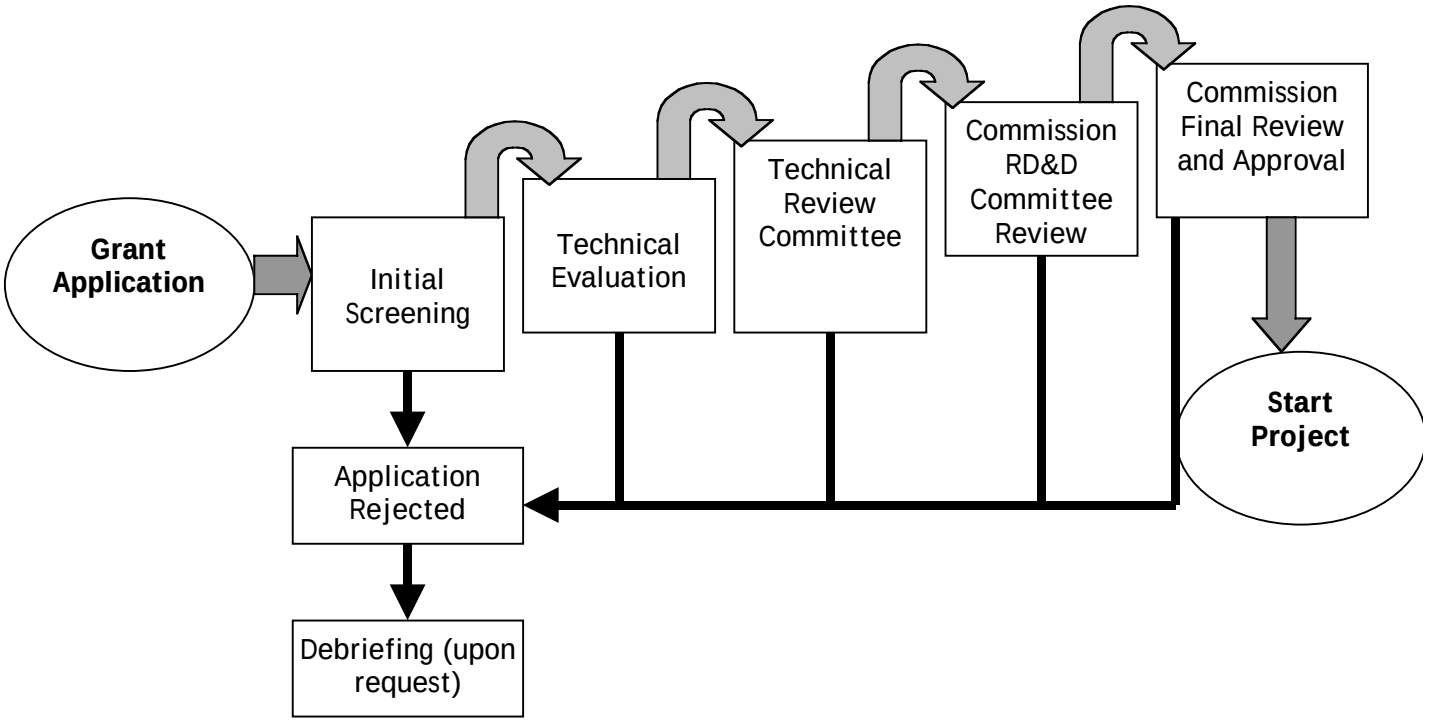
Questions addressed to the GCC Administrator that have broad applicability to applicants will be posted on the "Frequently Asked Questions" (FAQ) section in the California Energy Commission's web site at www.energy.ca.gov/contracts. Questions received up until one week before the application deadline will be answered. Please review the FAQ section periodically for updates.

Part 2. ADDITIONAL INFORMATION REGARDING PROGRAM FEATURES AND REQUIREMENTS

2.1. Grant Application Processing

Grant applications will be processed in the following phases (as outlined in Diagram 1):

Diagram 1: Grant Project Selection Process



2.1.1. Grant Application

Grant applications received on or before the specified cut-off date will enter the screening/evaluation process.

2.1.2. Initial Screening

The GCC Administrator will perform an administrative pass/fail review based on the criteria listed in Table 1 (Initial Screening Criteria) below; ***all criteria must be met.***

Table 1: Initial Screening Criteria

CRITERIA	SCORE
1. Proposal was received on time	PASS/ FAIL
2. Proposal is not marked proprietary in its entirety	PASS/ FAIL
3. Proposal is submitted by an eligible applicant	PASS/ FAIL
4. Proposed research does not duplicate existing research	PASS/ FAIL
5. Proposal is complete, does not exceed the maximum page requirement, and is submitted as required in Part 3 Grant Application Instructions	PASS/ FAIL
6. Proposal does not request more than the maximum amount	PASS/ FAIL
7. Proposed research clearly responds to the solicitation	PASS/ FAIL

Applications are placed in one of the following two categories after the initial screening:

- Satisfies all screening criteria and proceeds to Technical Evaluation and Review.
- Fails any of the criteria and application is rejected.

2.1.3. Technical Evaluation (TE)

Technical evaluators may be from academia, environmental organizations, industry, or government. The applicant may recommend qualified technical evaluators who are independent from the project team and are capable of conducting an unbiased evaluation with no conflict of interest. Recommendations are advisory in nature. The GCC Administrator is responsible for the final selection of the evaluators. The identity of the evaluators will be kept confidential.

Applications that pass the initial screening will be scored by a minimum of three technical evaluators with recognized expertise in the proposed subject area. Technical evaluators will score each proposal on the degree to which it meets each of the Technical Criteria summarized in Table 2, and described in detail in Appendix 1 (Technical Evaluation Criteria).

Raw Score	Proposal Response
0	Not responsive to the criterion
1-2	Response is minimal
3-4	Responds only marginally to relevant considerations under the criterion
5-6	Responds satisfactorily to most relevant considerations under the criterion
7-8	Responds satisfactorily to all relevant considerations under the criterion
9	Responds completely, accurately and convincingly to all relevant considerations under the criterion
10	Response is complete, specific and superior, both quantitatively and qualitatively

Table 2: Summary of Technical Evaluation Criteria Points 0-10

1. Degree to which the research proposal accurately and completely responds to the specific overall scope of work as described in one of the relevant Research Topics.	Weighting Factor: 1.5 Possible Points: 15
2. Degree to which applicant clearly identifies available and existing matching funds and/or cost sharing to supplement Commission funds and degree to which these funds clearly contribute to the overall robustness of the project (Budget Forms C-1 & C-2 and Item L).	Weighting Factor: 1.0 Possible Points: 10
3. Degree to which applicant clearly identified plans for obtaining new funds and/or cost sharing to supplement this proposal and the degree to which these funds would clearly contribute to the overall robustness of the project (Budget Forms C-1 & C-2 and Item L).	Weighting Factor: 0.5 Possible Points: 5
4. Degree to which the proposed research identifies clear, meaningful, and measurable objectives.	Weighting Factor: 1.5 Possible Points: 15
5. The Project Narrative (Section 3.4), Products and due dates (Section 3.4 Item 3), Budget Narrative and Budget Forms (Section 3.6 and Forms C-1 and C-2) are reasonable, appropriate, and demonstrate that there is a high probability of project success.	Weighting Factor: 2.0 Possible Points: 20
6. The Principal Investigator and the Project Team are well qualified to conduct the project (Form D).	Weighting Factor: 1.5 Possible Points: 15
7. Overall technical merit and degree to which the project is likely to succeed.	Weighting Factor: 2.0 Possible Points: 20
Maximum Technical Evaluation Points:	100

After receiving the technical evaluations and scores, the GCC Administrator calculates the averaged score for each proposal. The scores will be used to establish the preliminary ranked-order lists of proposals for each research topic that will be presented to the Global Climate Change Grant Technical Review Committee. The GCC Administrator determines the appropriate cut off line for proposals to be considered in the next stage of review by selecting those proposals with an averaged score that meet the minimum 51 point requirement, up to the top five proposals (maximum) per research topic. The GCC Administrator sends the rank-ordered list of proposal scores, proposal abstracts, and other relevant information to the Global Climate Change Grant Technical Review Committee.

2.1.4. Global Climate Change Grant Technical Review Committee

The Global Climate Change Grant Technical Review Committee (TRC) is responsible for (1) scoring each of the proposals that make it to this stage of review - their averaged scores will make up the preliminary scored and ranked list of projects for funding consideration by the Commission, (2) reviewing the Global Climate Change Grant Program policies, procedures, and documents, and (3) making recommendations for changes to the GCC Administrator. The TRC will be composed of PIER-EA Staff and selected technical representatives from interested state

agencies, and other research institutions. They will help ensure that the proposals recommended for funding are in alignment with the California Climate Change Research Center.

The TRC will score the merits of each proposal using the Technical Criteria summarized in Table 3, and described in detail in Appendix 2 (Technical Review Committee Criteria). Proposals will be evaluated and scored using the TRC evaluation criteria with a maximum of 50 points available. For each proposal, the GCC Administrator will calculate the averaged score of the TRC and add the averaged score to the technical score for the final total score. Based on the total final scores and input from the TRC, the Program Administrator will prepare a final recommended rank-ordered list of the proposals per research topic and make a funding recommendation.

The TRC will also review the Global Climate Change Grant Program policies, procedures, and documents and make recommendations for changes to the GCC Administrator.

Table 3: Summary Technical Review Committee Evaluation Criteria Points 0-10

1. Degree to which the research proposal responds to the specific overall scope of work as described in one of the relevant Research Topics.	Weighting Factor: 1.5 Possible Points: 15
2. Degree to which the proposed research identifies clear, meaningful, and measurable objectives.	Weighting Factor: 1.0 Possible Points: 10
3. The Principal Investigator and the Project Team are well qualified to conduct the project (Form D).	Weighting Factor: 1.0 Possible Points: 10
4. Overall merit, including a consideration of the degree to which the proposal goes beyond the basic requirements described in the relevant Attachment and the availability of matching funds.	Weighting Factor: 1.5 Possible Points: 15
Maximum Technical Reviewer Points:	50

2.1.5. Research, Development and Demonstration Committee (RD&D Committee)

The Global Climate Change Grant Program Manager (GCC PM) discusses the proposal selection process, the final rank-ordered list per research topic, and the funding recommendations from the Program Committee with the RD&D Committee. It is expected that only one proposal per research topic will be funded. The RD&D Committee may make a funding recommendation to the full Commission based on these recommendations and on other Commission program considerations. The RD&D Committee may disapprove any or all of the recommendations, for any or all of the following reasons:

- The proposal is counter to the development and implementation of a robust public interest RD&D portfolio of projects that address California's energy needs by focussing on the RD&D plans covering the PIER subject areas.
- The proposal is counter to the objective of balancing risks, timeframes and public benefits in a manner consistent with California's energy policies.

- The proposal is counter to the objective of creating a public interest RD&D knowledge base and disseminating information that allows citizens, businesses, government and other entities to make informed decisions concerning energy technologies and services.
- The proposal is counter to the objective that the public interest RD&D program is connected to the market.
- The proposal is counter to the energy policies of the State of California including, but not limited to, the policies for PIER and for energy in California as expressed in the following legislation and reports: AB 1890 (Chapter 854, September, 1996), SB 90 (Chapter 905, October, 1997), SB 1038 (Chapter 515, September, 2002), Warren-Alquist Act (CEC Publication No. P160-98-001), Strategic Plan Report on Implementing the RD&D Provisions of AB 1890 (P500-97-007, June 1997), 1997 California Biennial Energy Plan (P105-97-001), and the Five-Year Investment Plan, 2002 Through 2006 (P600-01-004).

Any proposal disapproved by the RD&D Committee will not affect the score of any other proposal. The RD&D Committee decides which ranked proposals merit forwarding to the full Commission for funding consideration but, again, it is expected that only one proposal per research topic will be funded. The RD&D Committee reserves the right to recommend lower ranked proposals under each research topic, if a higher ranked proposal has been disapproved by the RD&D Committee.

2.1.6. Commission Business Meeting

The final rank-ordered list per research topic and the recommendations from the RD&D Committee will be considered at a regularly scheduled business meeting. The Commission, at the Business Meeting, reserves the right to reject any or all of these recommendations and to select any proposal from the final rank-ordered list. Any proposal rejected by the Commission will not affect the score of any other proposal.

Proposals that receive Commission approval for funding will receive an award letter and will be posted on the PIER-EA section of the Commission web site.

2.2. Unfunded Proposals

Following the Commission approval of project funding, those applicants whose proposals were not funded will receive a letter from the GCC Administrator that describes the reason(s) for rejection.

All materials submitted in response to a PIER-EA Global Climate Change Grant Program solicitation become the property of the State of California for disposition purposes. Except for a file copy retained for future reference, all hard copies of the grant application will be shredded at the end of the evaluation process.

2.3. Grant Applicant Feedback and Disputes

An applicant may obtain a debriefing regarding an unfunded proposal in the following two ways:

1. By contacting the GCC Administrator to discuss the proposal.
2. By submitting a written (letter or email) list of questions or issues within 30 days of receiving the status letter on the proposal in question. The GCC Administrator will respond to written inquiries in writing (letter or email) within 30 days after the request has been made.

2.4. Modifications

To make a project acceptable, the Commission or GCC Administrator retains the right to negotiate minor changes to a proposal's Project Narrative and/or budget at any time during the evaluation, approval and agreement execution process. Such modifications would be made to:

- Adjust the project scope to produce the information needed;
- Adjust project budget to comply with guidelines related to authorized expenses;
- Avoid duplication of work;
- Reduce administrative requirements; and/or
- Include tasks necessary for project success.

Note: budget cannot be adjusted to exceed funding limit.

2.5. Intellectual Property Rights

Deliverables and reports specified for delivery to the Commission become the property of the Commission. All data produced under the grant agreements are the property of the Awardee, subject to use rights by the Commission.

Patent rights for any invention are the property of the Awardee whose employees or researchers are inventors of such an invention, subject to the Commission's use rights for Governmental Purposes. See Sample Subaward, including Terms and Conditions document Exhibit A-4 for details on Intellectual Property.

The Awardee must disclose to the GCC Administrator, on a confidential basis, all such inventions. The GCC Administrator will take reasonable precautions to protect the intellectual property rights of the applicants and Awardees by requiring all personnel who handle, screen or review proposals and deliverables containing proprietary/confidential information to sign a non-disclosure agreement (see Appendix 3. Sample Non-Disclosure Form).

Part 3. GRANT APPLICATION INSTRUCTIONS

3.1. Grant Application Package Checklist

The application package must be assembled **in the order shown in the checklist below and as one file**. Additional instructions for filling out the forms are provided with each form. Provide all information necessary to allow adequate review of the proposal, including all information requested in this Manual. Do not incorporate by reference information contained in videotapes or in other extraneous materials. The full application package submitted will be the basis for approving or denying funds for the proposed project.

Electronic submission is preferred. However, if your institution requires hardcopy submission of a proposal application, you may mail the original and 8 full single-sided copies including any supporting documents. The original should be bound only with a spring clip; the other eight copies should be bound only with a staple in the upper left corner. **No covers or other types of bindings are allowed**.

For electronic submission only: Cover email must be from an institutional representative who is authorized to contractually commit the submitting organization to performing the proposed work; this must be the same individual listed on the Grant Application Cover Page. The email must identify the Principal Investigator and the title of the proposal, and should state the following: "The attached application constitutes [Institution Name]'s official submission of a proposal in response to RFP No. CIEE-GCC-2003-1." The email must give the title of the authorized institutional representative (e.g., Contracts and Grants Officer), and provide contact information, including address, phone, and fax. If this is a multi-institution submission, the email must also state that the lead (submitting) institution has received concurrence on the proposed work from the authorized institutional representatives of all participating institutions.

- ☐ Form A: Grant Application Cover Page *(signed and dated, if submitted in hardcopy)*
- ☐ Project Summary *(2 pages maximum, single-spaced; insert page break after project summary)*
- ☐ Project Narrative *(15 page maximum, single-spaced)*
- ☐ Appendices to Narrative *(optional - 10 page maximum, single-spaced.)*
- ☐ Form B: Certifications
- ☐ Form C: Proposed Budget Summary *(attach short budget narrative if required)*
- ☐ Form D: Project Personnel and Team Qualifications (one page maximum)
- ☐ Key Personnel Résumés (Curriculum Vitae) *(A maximum of two pages per person. Required for Principal Investigator, Project Manager, and other technical personnel critical to the project's success.)*
- ☐ Form E (*electronic submission only*): Recommended Reviewers

If submitting hardcopy, the following optional items should be loose or clipped to the original application package and not bound with the proposal copies:

- ☐ Cover Letter *(optional; one copy)*
- ☐ Form E: Recommended Reviewers *(optional; one copy)*

Faxed copies will not be accepted.

3.2 Formatting Requirements for All Text Sections

All electronically submitted documents should be in either Microsoft Word or PDF format. Page margins no less than 1", font size no smaller than 12 points; either single- or double-spaced is acceptable. Page numbers should be on the upper right-hand corner of each text page and pages should be single-sided.

3.3. Project Summary

Provide a separate, two-page, non-proprietary summary description of the grant project. Title the page with "Project Summary" followed by the project title and name of the Principal Investigator and submitting institution. The project summary should summarize the key items requested in the recommended narrative format specified in Part 3.4. The description should be written at a level that could be understood by the general public with sufficient information to stand on its own. All projects selected for funding will likely have a project summary posted on the Commission web site at the onset of the project, as well as a final project summary posted at the end of the project. You must make a notation on the page if the project summary contains proprietary information. If a proposal containing proprietary information is selected for funding, you will be asked to provide a non-proprietary version of the project summary for web publication.

3.4. Project Narrative

Provide a project narrative that is no more than 15 pages in length (not counting reference list, acronyms list, or Attachment Forms A-E) that describes the project plan in detail. Key supporting documents referenced in the narrative such as photos, charts, drawings, blueprints, graphics, letters of support and excerpts from key articles may be included as appendices to the project narrative. The project narrative must address the content items identified in the following recommended outline; however, the sequence in which the information is presented may be determined by the applicant. Project narratives that cite past research, trade publication articles, etc. must include a reference list. All acronyms should be spelled out in full when first cited.

Project Narrative

1) Project Goal

Accurately and completely identifies the importance of your research as it relates to the solicitation topic.

2) Project Objective(s)

Describe clear and measurable objectives that demonstrate how the project will address the solicitation issue.

3) Primary Tasks, Deliverables, and Budget

- Provide a description of the work and associated task budget that will be conducted to accomplish the primary tasks.
- Provide a description of key deliverables (e.g., quarterly reports, draft and final reports, draft and final two-page project summary).
- Indicate when deliverables will be submitted.

4) Matching Funds and/or Cost Sharing (Optional)

- Provide a description of how matching funds and/or cost sharing are used and/or will or may be used in this proposal. Explain if the funds/costs are existing or potential.

Applicants should take into consideration the evaluation criteria listed in Appendix 1 (Technical Evaluation Criteria) when writing the narrative.

3.5. Proprietary Information

If the proposal contains proprietary information, as indicated on Form A, Item G, then the applicant must clearly mark those sections in the application. For electronic submissions, the footer of each proprietary page or section must contain the words "Contains proprietary information," and the appropriate text should be highlighted. For hardcopy submissions, this could be in the form of a classification stamp at the top and bottom of classified pages or boxes placed around specific paragraphs or annotations in the margin that clearly identify those sections that are proprietary. Applicants are encouraged to limit the proprietary information to only that which is necessary to adequately assess the technical merits of the proposed concept. Classifying an entire proposal as proprietary is not acceptable.

Appropriate procedures to safeguard proprietary or confidential information will be employed by the GCC Administrator, the Commission, its subcontractors and technical reviewers.

3.6. Budget Narrative

Attach a budget narrative to Forms C1-C2 (Proposed Budget) to explain any expenses listed in Items D, E, F, H, and L (subcontracts/consultants, equipment, travel, other direct costs items greater than $500, and matching funds/shared costs (existing and potential)). See instructions for Forms C-1 and C-2.

Part 4. GRANT AWARD AGREEMENT

4.1. Grant Agreement

Once a proposal is approved for funding by the Commission, the GCC Administrator will send an award notification letter to the applicant containing a list of any outstanding issues that need to be resolved prior to executing the agreement. The agreement will be mailed under separate cover once all outstanding issues have been resolved. The agreement must be signed by authorized representatives of both parties before work may begin or expenses reimbursed.

The GCC Administrator intends to base agreements on the Sample Subaward Agreement including Terms and Conditions (see Exhibit A-4). All applicants should review the standard terms and conditions contained in the Sample Subaward Agreement prior to submitting a proposal, and should be prepared to identify those issues that need to be resolved in the event of an award. Failure to agree to the terms, conditions and requirements of the grant agreement are grounds to cancel the award.

4.2. Grant Performance

Once a grant is approved for funding, the Awardee's personnel and any subawardees performing work under the award shall be responsible for exercising the degree of skill and care required by customarily accepted good professional practices and procedures used in scientific and engineering research fields. The GCC Administrator will approve invoices based on grant performance and receipt of deliverables.

4.2.1. Reimbursement of Invoices

PIER-EA Global Climate Change Grant Program funds are distributed for reimbursement of actual project expenses in arrears. Invoices for reimbursement should be submitted on a monthly or quarterly basis to the GCC Administrator for periods not less than one month. Reimbursement invoices submitted to the GCC Administrator will be paid within 30-60 days of receipt, unless contested. The GCC Administrator retains the right to withhold payment for the following reasons: (a) progress reports are not current; (b) progress reports contain insufficient detail to assess Awardee's progress; or (c) there is evidence of poor performance.

A retention payment of 10% of the total award will be held and not be paid to the Awardee until the GCC Administrator has reviewed the final deliverables and judged them acceptable.

4.2.2. Deliverables

Awardee must submit all deliverables to the GCC Administrator. The minimum required deliverables include:

(a) Progress Reports: A progress report is required following the end of every standard calendar quarter; if a project begins in the middle of a calendar quarter, the progress report will cover whatever work has been done during the quarter. Progress reports must

be delivered within 10 days of the end of each quarter.

(b) Final Report: A draft report is to be submitted for review and comments (includes abstract, executive summary, and main report). The Program Administrator will review the draft report and provide written comments and recommendations. The Awardee is responsible for incorporating the recommended changes in the Final Report. The Final Report will likely be posted on the Commission website.

(c) Final Project Summary: A draft and final non-proprietary summary description of the grant project is to be submitted for review and comments. Title the page with "Project Summary" followed by the project title and name of the Principal Investigator and submitting institution. Include information on matching funds and shared costs used in the project. The project summary should summarize the final results of the key items requested in the recommended narrative format specified in Part 3.4. The description should be written at a level that could be understood by the general public with sufficient information to stand on its own. This write-up should not contain proprietary information as it is likely to be posted on the Commission website and will be available for those inquiring about the project.

4.2.3. Tax and Legal Issues

If in doubt, Awardees should consult with legal and tax advisors (at the Awardee's expense) to fully understand the legal and tax obligations incurred when entering into a grant contract.

California Energy Commission PIEREA Global Climate Change Grant Program **GRANT APPLICATION COVER PAGE**	**FORM A**

A Project Title: _____

B. Research Topic: ***[for electronic submission: select and press "n" to check box]***

❑ Research Topic-1 ❑ Research Topic -2 ❑ Research Topic-3 ❑ Research Topic -4

C. Applicant Category: *[for electronic submission: select and press "n" to check box]*

❑ Individual ❑ Academic Institution
❑ Small Business ❑ Non-Profit
❑ Large Business ❑ State Agency
❑ National Laboratory ❑ Federal Agency ❑ Other (Please specify: _____)

D. Grant Funding Requested: $_____ *(maximum allowed Research Topic 1 - $100,000; Research Topic 2 - $400,000; Research Topic 3 - $100,000; Research Topic 4 - $600,000)*

E. Proposed Project Duration: _____ *(maximum duration allowed: Research Topic 1 - year; Research Topic 2 - 5 years; Research Topic 3 -1 year; Research Topic 4 – 3 years)*

F. Principal Investigator

Name:		Address:
Phone:	Fax:	
Email:		
Organization:		
Position/Title:		

G. Authorized Institutional Representative: *(serves as point of contact for contractual issues)*

Name:		Address:
Phone:	Fax:	
Email:		
Organization:		
Position/Title:		
Signature:		Date:

H. Proprietary/Confidential Information:

❑ NO – Proposal does not contain proprietary information, unrestricted distribution authorized.

❑ YES - Proposal contains proprietary information, restrict distribution and disclosure. If proposal is marked proprietary in its entirety, it will be rejected. *(clearly mark and label those sections that are proprietary on all copies)*

FORM A
INSTRUCTIONS

Grant Application Cover Page

Item A: Project Title

Item B: Proposal Research Topic
Check one box that corresponds to the research topic that the proposal addresses.

Item C: Applicant Category
Check one box that represents the applicant category you are applying for a grant under. The applicant categories are defined in Part 1 of this manual. The category marked in Item C must match the information certified on Form B.

Item D: Grant Funds Requested
Specify the amount of grant funds needed to complete the proposed project. If submitting more than one proposal (for more than one of the four research topics) – make sure that there are separate and distinct proposals and budgets for each research topic. All project costs must be covered by the amount unless the applicant or other sources are contributing funds to this project.

Item E: Proposed Project Duration
Specify how many months you need to complete the project. Include the time it takes to complete the final report after all data collection and analysis functions have been performed.

Item F: Principal Investigator

Item G: Authorized Institutional Representative
This individual must be authorized to commit the organization to perform the proposed work. If the application is submitted via hardcopy, this person must sign the form; if it is submitted electronically, the cover email must be from the authorized institutional representative.

Item H: Proprietary/Confidential Information
Indicate if the proposal contains any proprietary information that requires protection. Clearly mark and label those sections that are proprietary on all copies. If a proposal is marked proprietary in its entirety, it will be rejected.

California Energy Commission PIER-EA Global Climate Change Grant Program CERTIFICATIONS	FORM B

A. APPLICANT ELIGIBILITY CERTIFICATION

_ **Individual** Must be acting independently. If employed or affiliated with an organization, applicant has authorization from the organization to pursue grant research exclusively as an individual with no rights reserved to the organization. The individual, not the organization, retains all intellectual property rights accrued from the grant project *(if employed or affiliated with an organization or business, specify in the space below any financial interest the organization or business has in the proposed project)*. NOTE: Applicants who are employed by a college/university or affiliated laboratory are not eligible to apply as individuals; submissions ***must*** be made through the applicant's home institution.

_ **Small Business** PIER uses the Federal definition of small as specified in Title 13, Code of Federal Regulations, Part 121 (13 CFR § 121), Small Business Size Regulations (http://www.sba.gov/regulations/siccodes/). Size requirement varies based on type of business with the average requirement being either prior year gross receipts of $5 million or total employees cannot exceed 500 *(in the space provided below, specify your SIC Code and either the number of employees or gross revenues for prior year that qualify your organization as a small business).*

_ **Large Business**

_ **Non-Profit Organization** Possess IRS tax exemption.

_ **Academic Institution** Public or private post-secondary institutions.

_ **Local, state and federal governmental organizations.** Local, state and federal governmental agencies, Federal laboratories or other Federally Funded Research and Development Centers.

Item (A) Information:

B. MULTIPLE AWARDS FOR THE SAME OR SIMILAR RESEARCH

_ Checking this box certifies that the grant applicant acknowledges that, in the event they receive a PIER-EA Global Climate Change Grant Program grant, they agree to notify the Program Administrator if they enter into a concurrent contract that requires the same or similar research as proposed in this application and in this event further agrees to limit reimbursement from the PIER-EA Global Climate Change Grant Program to costs that are not covered by other awards. If the applicant has previously received State or Federal funds (such as SBIR awards) to develop the proposed concept, attach a short description of the work completed and provide contact information (phone and/or email address) for the project managers at the funding agencies.

FORM B
INSTRUCTIONS

Certifications

Item A: Applicant Eligibility Certification

You must check one of the six boxes to indicate the applicant eligibility criteria under which you are applying. Even if you qualify under more than one criteria (i.e., sole proprietor vs. individual), indicate the **one** that best fits your situation. Different categories have different restrictions (i.e., ability to invoice indirect expenses and ownership of intellectual property) to which the applicant will be held. Provide the additional information requested (SIC codes, number employees, gross revenues etc.) in the space provided. Fraudulent misrepresentation of eligibility is grounds for immediate termination of award.

Item B: Multiple Awards for Same or Similar Research

This certification prohibits applicants from seeking reimbursement from more than one funding source for the same work and must be certified in order to qualify. Applicants must disclose if they have previously received State or Federal funding for work related to the PIER-EA Global Climate Change Grant Program proposal.

California Energy Commission PIER-EA Global Climate Change Grant Program PROPOSED BUDGET SUMMARY	FORM C-1

Project Title: _____

Performing Institution: _____

Principal Investigator: _____

Period of Performance: _____

		Effort WM or FTE	Rate	Est Cost	Total Cost
A.	DIRECT LABOR (Explanation attached)				
	PI:	0.00	0	0	
	_____	0.00	0	0	
	TOTAL Labor	0.00			0
B.	FRINGE BENEFITS (Explanation attached)	Rate	X Base	Est Cost	
		0.0%	0	0	
	TOTAL Fringe Benefits				0
C.	TOTAL SALARIES AND FRINGE (A+B)				0
D.	SUBCONTRACTS and CONSULTANTS (Explanation attached)				0
E.	EQUIPMENT and SINGLE PURCHASES over $5,000 (Explanation attached)				0
F.	TRAVEL (Explanation attached)				0
G.	MISCELLANEOUS EXPENSES (Explanation attached)				0
H.	OTHER DIRECT COSTS (Explanation attached)				
	H.1 _____			0	
	H.2 _____			0	
	TOTAL Other Direct Costs				0
I.	TOTAL DIRECT COSTS (C thru H)				0
J.	INDIRECT COSTS (Explanation attached)	Rate	X Base	Est Cost	
		0.0%	0	0	
	TOTAL Indirect Costs				0
K.	TOTAL COSTS (I+J)				0
L.	EXISTING MATCHING FUNDS (OPTIONAL – Explanation attached)				0
M.	TOTAL BUDGET				0

Summary Project Budget **FORM C-2**		PIER Reimbursable Task Costs	* Existing Match Task Funds	Total Task Costs
(insert name of Organization)				
Task 1	(Insert Name of Task)	0	0	0
Task 2	(Insert Name of Task)	0	0	0
Task 3	(Insert Name of Task)	0	0	0
Task 4	(Insert Name of Task)	0	0	0
Task 5	(Insert Name of Task)	0	0	0
Task 6	(Insert Name of Task)	0	0	0
Task 7	(Insert Name of Task)	0	0	0
Task 8	(Insert Name of Task)	0	0	0
Task 9	(Insert Name of Task)	0	0	0
Task 10	(Insert Name of Task)	0	0	0
Task 11	(Insert Name of Task)	0	0	0
Task 12	(Insert Name of Task)	0	0	0
Task 13	(Insert Name of Task)	0	0	0
Task 14	(Insert Name of Task)	0	0	0
Task 15	(Insert Name of Task)	0	0	0
	****Project Totals**	0	0	0

***For actual existing matching funds only.**

** Please include a brief write-up of any existing or potential matching funds and/or shared costs in the Budget Narrative section of the grant application (Form C – Item L) – indicate if the funds/costs are existing or potential.

FORMS C-1 and C-2
INSTRUCTIONS

Proposed Budget and Narrative

General Information:
This budget form is available as an Excel file on the PIER Program web page http://www.energy.ca.gov/contracts with the math formulas inserted. Attach a budget narrative to this form if budget entries are made in Items D, E, F, H, or L.

The following **costs** are generally **not allowed** in PIER-EA Global Climate Change Grant projects:

- Costs incurred by applicants in preparing proposals (including travel and personal expenses).
- Project debts or costs incurred before Commission approval and the effective date of the grant agreement.
- Costs for lobbying or attempting to influence any public official.
- Costs associated with protecting intellectual property.
- Costs to offset obligations of individuals or work not associated with the approved project.
- Procurement of general-purpose equipment (e.g. general-purpose computers, software, fax machines, copiers, office furniture and tools) that is essential to the project and that could be leased or rented at lower cost.
- Costs of news releases announcing the results of a PIER-EA Global Climate Change Grant project.
- Relocation costs of employees or staff members.
- Financial aid, scholarships, or fellowships, except when paid under established campus policy as part of the compensation for research performed in the PIER-EA Global Climate Change Grant project during the term of the contract.

Item A. Direct Labor
Labor expenses incurred by the Awardee's personnel and team members during the performance period of the grant agreement are allowable to the extent that the compensation is reasonable for each individual's skill level and experience and conforms to consistently-applied compensation policies of the individual's organization.

Provide name and title of all senior research personnel. For as-yet unidentified persons, state the personnel category (e.g., technician, graduate student, administrative assistant, machine shop).

Show effort level (e.g., FTEs or work-months (WM), hours), rates, and cost for each researcher or personnel category. If both academic year and summer rates are used, show separately and identify as such (e.g., "Student, summer" and "Student, acad yr."). For pooled effort recharges, average pay rates are acceptable provided they are noted in the Budget Explanation page.

Item B. Fringe Benefits
Fringe benefits are allowable as a direct cost (if not included as an indirect cost) in proportion to the salary charged to the grant and provided the expense is based on formally established and consistently applied compensation policies of the individual's organization. If a student receives compensation for hours worked and tuition fees, show the tuition as a separate line in Item H - Other Direct Costs. Applicants who apply as an "*Individua*l" should not charge Fringe Benefits, and instead should show a fully loaded hourly rate.

Show fringe rate and base to which rate applies. If different rates apply for different labor categories or time periods (e.g., career vs. student, summer vs. academic year), show separately and discuss on Explanation page.

Item D. Subcontracts and Consultants
No more than 40% of an award may be outsourced, and all subcontractors must comply with the applicable clauses in the grant agreement. If a subcontractor has been identified who is critical to the success of the project, the application must include a letter from the subcontractor confirming that they concur with the statement of work and intend to participate in the project. Payments to consultants are allowed provided the costs are reasonable and commensurate with the services provided and are included and itemized in the approved budget for the grant.

- Subcontracts: On Explanation page, give name of each subcontractor, a brief description of work, and total cost. Include curricula vitae for the subcontractor's key personnel. For any subcontract over $10,000, attach a complete budget following the same format outlined here.
- Consultants: On Explanation page, state the name of each consultant (or function, if an individual has not yet been identified), effort level (hours or days), and rate charged. Give brief description of activities/tasks (e.g., "responsible for integrating

time-of-use curves into calculation tool"). Include curricula vitae for any consultant who has been identified.

Item E. Equipment and Single Purchases over $5,000

Major equipment is defined as non-expendable, tangible property which has an acquisition cost of $5,000 or more per unit and a useful life of two years or more. Major equipment purchases and items costing in excess of $5,000 will be considered allowable as direct costs provided that (1) the item is necessary for completing the primary objectives of the grant research, and (2) renting or leasing the item at lower cost is not an option.

All major equipment and single purchases over $5,000 must be itemized in the budget narrative. All equipment with a unit cost of $5,000 or more will be purchased exclusively by the PIER-EA Global Climate Change Grant Program Administrator and will be subject to the following terms and conditions:

- Title to all non-expendable equipment purchased with PIER-EA Global Climate Change Grant Program funds shall vest with the GCC Administrator, and may be used in the original project for which it was acquired as long as needed.

- The Awardee shall assume all responsibility for maintenance, repair, destruction and damage to equipment while in the possession of or subject to the control of the Awardee (costs for maintenance and insurance may be borne by the grant).

- At the end of the original project, the Awardee shall contact the GCC Administrator for equipment disposition instructions. This shall occur concurrent with the filing of the final report and payment of retention will not be made until letter is submitted. If no disposition instructions are provided within 120 days after end of the project period, the Awardee shall have no further obligation to the GCC Administrator regarding the equipment.

Item F. Travel

Travel costs are allowable if they are allocable to the research and are reasonable for a small grant effort. Conference travel is allowable if it occurs towards the end of a project for the purpose of presenting a paper on the results of the research. Applicants should consider cost-sharing conference travel in excess of $1500, or risk having the travel deleted from the budget. For travel to be reimbursed, it must occur within the performance period of the grant agreement. Reimbursement of travel expenses will be in accordance with the guidelines contained in Section 4.2.1.

For each anticipated trip, give *specific* information regarding destination, estimated air fare/transportation costs, lodging/per diem, registration fees, and other related costs. Foreign travel is not permitted without prior approval. If more than one person will participate in a specific trip, indicate the number of people traveling.

Item G. Miscellaneous Expenses
Include office supplies, postage, telephone, miscellaneous operating costs, and low-value materials under $500 that are associated with the work.

Item H. Other Direct Costs
List items that are in excess of $500 that are necessary to the performance of the work, including utilities, graduate student tuition remission, workshops, and departmental recharges. Details must be provided in the budget narrative; failure to include an explanation may result in disqualification of the application. Other items to include:

- Equipment Rental or Lease: The cost of renting or leasing equipment is allowable provided the charges are reasonable. General-purpose equipment (i.e., computers, printers, furniture, test equipment, tools, software) essential to the project may be rented but not purchased unless renting is more expensive or not practical. In those instances where a case can be made for purchasing general-purpose equipment, provide the rationale in the budget narrative. Disposition of general purpose equipment at the end of the project will be determined by the Program Administrator.
- Facility Lease/Modification: The cost of leasing or renting commercial workspace is acceptable; however, individuals cannot charge rent for any portion of their private residence, and a business that charges an indirect rate cannot charge a lease expense for space or equipment that they already own. PIEREA Global Climate Change Grant funds cannot be used to fund construction or facility improvements. However, rearrangement and alteration costs to adapt space or utilities within a completed structure to accomplish the objective of the grant-supported activity, which do not constitute construction, and aggregate to less than $10,000, may be allowable provided that the requirement is clearly defined in the Budget Narrative.

Item J. Indirect Costs
Not applicable for Individuals, who should include appropriate overhead costs in their fully-loaded labor rate. Small businesses, non-profits, and academic institutions that choose to recover indirect costs may use an established rate based on the following priority, and must indicate in the Budget Narrative which rationale they are using:

1. The rate used when doing similar research for the State of California or other state government;
2. The rate used when doing similar research for the Federal Government; or
3. The rate used and consistently applied to similar research contracts performed in the civilian sector.

If no indirect rate has been established, then a maximum indirect rate of 20% will be allowed on this grant. Individuals and organizations that do not claim an indirect rate may charge as a direct expense the incremental cost of obtaining the insurance coverage specified in the Attachment A-4 Sample Subaward Agreement.

For the purpose of this program, general and administrative expenses (G&A) is considered an indirect cost.

In the Budget Narrative, indicate any exclusions from the indirect cost base (e.g., subcontracts, graduate student fee remission, facilities lease costs).

Please double-check your figures.

Item L. Matching Funds and/or Shared Costs (Optional)
Complete Budget Forms C-1 and C-2 - only existing matching funds should show up in these forms. Describe in a few paragraphs existing and/or potential matching funds and/or shared costs and how you will use them to match and supplement the funding from the Commission. Make sure to indicate if the funds/costs are existing or potential. Explain how match funds will lead to, for example, increased staff, increased project scope, etc. Also, if there is a cost sharing component of your application, please explain how this will supplement Commission funding by, for example, an institution providing in-kind services, such as laboratory use or staff resources.

California Energy Commission PIER-EA Global Climate Change Grant Program PROJECT PERSONNEL	FORM D

List all key technical personnel on the project who are critical to the success of the work, including the Principal Investigator and Project Manager, if they are separate individuals; indicate a descriptive title after each name (e.g., Electrical Engineer; Graduate Student Research Associate, etc.). In the space below, provide a brief summary of qualifications of the project team, including any existing facilities or specialized equipment that will be used on the project. Do not exceed one page. Attach résumés for all key personnel, not to exceed two pages each.

1. List of Key Personnel and Titles

2. Summary of Team Qualifications

California Energy Commission PIER-EA Global Climate Change Grant Program RECOMMENDED REVIEWERS	FORM E

The grant applicant has the option to recommend technical reviewers that they would like the PIER-EA Global Climate Change Grant Program Administrator to consider when deciding which technical reviewers to use for evaluating their proposal. The Program Administrator retains final decision authority on selecting reviewers. Please email this form to the Program Administrator, or submit it as loose or clipped hard copy to the original application, not bound with the proposal copies.

First Recommendation

Name:	Address:
Phone: Fax:	
Email:	
Organization:	
Position/Title:	

Indicate why you consider this individual qualified in the subject area proposed.

Second Recommendation

Name:	Address:
Phone: Fax:	
Email:	
Organization:	
Position/Title:	

Indicate why you consider this individual qualified in the subject area proposed.

Third Recommendation

Name:	Address:
Phone: Fax:	
Email:	
Organization:	
Position/Title:	

Indicate why you consider this individual qualified in the subject area proposed.

FORM E
INSTRUCTIONS

Recommended Reviewers

General Information:

- This form is optional. Please email this form to the GCC Administrator, or submit it as loose or clipped hard copy to the original application, not bound with the proposal copies.

- The intent of this form is to assist the GCC Administrator in identifying potential qualified technical reviewers for proposals. Of particular interest are individuals that possess expertise in very narrow and specialized areas of science and/or technology that the typical technical reviewer of energy research may not be familiar with.

- Do not recommend individuals that would have a conflict of interest in reviewing your proposal or would even give the appearance of conflict of interest or bias.

- The GCC Administrator retains the final authority to select the technical reviewers.

Research Topic 1

Protocol for the Inter-comparison of Regional Climate Models for California

I. Background Information

Impact and mitigation analyses play an important role in enabling California planners and policy makers to craft effective policies and regulations. These analyses rely, to a large extent, on the results of sound climate change monitoring, analysis, and modeling efforts. The development of climate change scenarios for California, using the best scientific tools, must be a priority for California and PIER-EA.

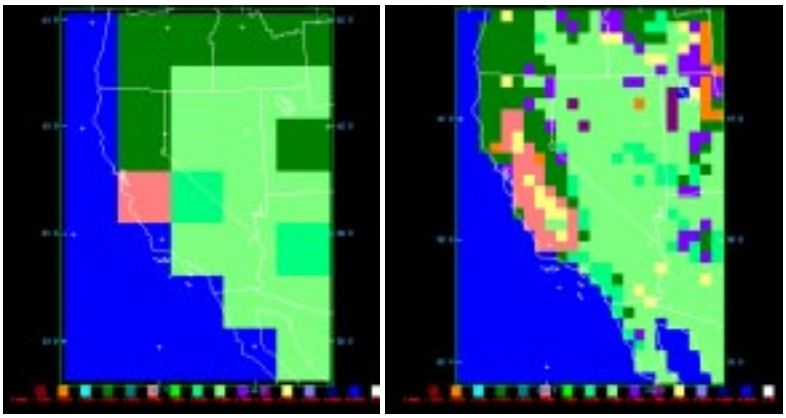


Figure1. Resolution at GCM scale and 50 km.

General circulation models (GCMs) are complex computer models that are used to simulate natural and human-induced climate changes on a global scale. They make use of large grid cells (on the order of 300 km) that cannot resolve important topographic features such as the Sierra Nevada and the coastal mountain ranges, as shown in Figure 1. At the 50-km resolution, common to many regional models, the Central Valley and Sierra Nevada begin to be discernible. Regional models are used to translate or downscale the results from global circulation models producing more realistic regional climate scenarios in part due to their higher geographical resolution.

PIER-EA-sponsored research on regional climate should address the following questions:

- How is the climate in California changing in relation to the historical and pre-historical conditions? How much of this change can be attributed to natural variability?
- What are the expected signals of a changing climate in the state, and how should they be monitored?
- What are the potential changes of California climatic conditions, based on the increased concentration of GHGs in the atmosphere?
- What is the estimated likelihood of each of the different climatic scenarios?
- How would the frequency and severity of extreme events change in the future?

- What is the potential impact of abrupt climate changes in the state, and how would the potential new climate look?
- Which GCMs are most appropriate for providing inputs to the study of regional climate change affecting California?

This research topic will allow PIER-EA to start addressing some of these questions by developing a protocol that will subsequently be used to compare regional models against each other and against observational data prior to their use for the development of climate scenarios for California. This research topic, however, only involves the development of a protocol and does not include actual inter-comparison work.

II. Project Description

Although many regional models have been used to simulate the climate over selected regions of the United States and elsewhere (Houghton et al. 2001), there has been little attempt to evaluate and inter-compare the models at the needed resolution. This lack of standardized experimental conditions makes it difficult to identify characteristic model errors. There is also a need to compare statistical method models against dynamic or numerical regional climate models (RCMs), as well to compare outcomes of models with historical data not used in the development of their outputs.

The protocol must contain guidance on different options for selecting GCMs modeling outputs that are adequate for California regional modeling. It is expected that the inter-comparison would include both historical data and GCM outputs that adequately represent features of importance for California. For example, to the extent feasible, the GCMs should be able to represent the historical variability of El Nino Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO) cycles reasonably well (Collins et al. 2001). Also, the protocol should identify the methods that can be used to minimize the influence of poorly performing GCMs when creating regional simulations (Giorgi and Mearns 2002) or only use GCMs that, in general, replicate historical conditions in the "California region" relatively well.

The implementation of the modeling protocol, which will take place in a subsequent project, will inter-compare RCMs and statistical models and other promising modeling approaches. The protocol should provide different implementation options and should indicate the levels of funding needed for these options. One low cost option, for example, would be the use of statistical models to downscale the outputs from selected global circulation models directly without the use of costly dynamic regional model runs. At the other, more costly, extreme, the model inter-comparison would involve the use of several dynamic regional models driven by several GCM scenarios.

The model inter-comparison protocol should be developed with input from modelers, climatologists, and climate impact researchers through multiple avenues including the organization of at least one workshop. Some of the issues that should be discussed at the workshop(s) include: (a) modeling domain, (b) statistical evaluation of the models, (c) boundary and initial conditions, (d) computer resources needed, (e) selection of GCM modeling outputs, (f) methods needed for the identification of modeling biases, (g) coordination with national and international efforts, (h) desirable degree of geographical and temporal resolution, (i) formal and informal methods to estimate the likelihood of different regional climate scenarios, and (j)

execution strategy. The aforementioned workshop must be coordinated with any other workshop that the PIER program may co-sponsor on related matters.

The research should exploit, to the maximum extent feasible, past and ongoing work in this area such as: (1) the PIRCS (www.pircs.iastate.edu/) and the PRUDENCE (www.dmi.dk/f+u/klima/prudence/) programs; (2) and the outcomes of the workshop organized by the U. S. Department of Energy on regional modeling (Leung 2003); and (3), as well as ongoing modeling work at Scripps, Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, and other institutions.

Scripps will participate in any model inter-comparison work using the models and methods developed as part of their PIER core research activities. Scripps is developing a comprehensive meteorological and hydrological database for the state representing historical conditions for the last 100 years. The database will be very useful for the model inter-comparison work. Scripps is also testing a dynamic regional climate model (Regional Spectral Model) simulating climatic conditions in California for the last 50 years using a 10 Km grid resolution. Finally, Scripps is enhancing new statistical downscaling techniques with the goal of capturing extreme events. All of these activities should be considered in the preparation of the protocol.

In summary, the proposals should provide a plan on how the researchers would develop the protocol described above. The proposals should provide different implementation options that may be summarized as low, medium, and high cost options, and should include a discussion about the different pros and cons, and the estimated level of funding necessary for each option. The protocol should address, in general, the following topics: 1) GCM model outputs; 2) details on how to inter-compare regional models and; 3) a preliminary plan on how to generate climate scenarios for California. The final plan on how to generate climate scenarios for California, however, will most likely be developed after the model inter-comparison takes place.

III. Relevance to the PIER Program

The standardization of modeling protocols would enable the state to evaluate models, compare data, and identify the most appropriate RCM(s) and GCMs for California applications. This work is crucial for the development of realistic climate scenarios for California.

IV. Project Term

One year.

V. Maximum Amount of Funds Available

Up to $100,000. Project teams with prior experience in this type of work and willing to provide additional resources for this effort and for the subsequent implementation of the protocol are encouraged to submit proposals.

VI. Matching Funds and/or Shared Costs

PIER funds will be available to carry out the basic requirements of the work described in this document. Additional funds, however, are needed to perform some numerical experiments and additional or more in-depth analyses that will greatly benefit the development of the model inter-comparison protocol. Proponents are encouraged to provide matching funds and/or shared costs for this additional work. Please include a brief write-up of any existing or potential matching funds and/or shared costs in the Budget Narrative section of the grant application (Form C – Item L) – indicate if the funds/costs are existing or potential.

VII. References

Collins, M., S. F. B. Tett, and C. Cooper. 2001. "The internal climate variability of HadCM3, a version of the Hadley Centre coupled model without flux adjustments." *Climate Dynamics* 17: 61–81.

Franco, G., R. Wilkinson, A. H. Sanstad, M. Wilson, E. Vine. 2003. *PIEREA Climate Change Research, Development, and Demonstration Plan.* California Energy Commission. PIER Environmental Area. Draft. February 19.

Gates, W. L. 2002. *Modeling Regional Climate Change in California.* Attachment I to Franco, G., R. Wilkinson, A. H. Sanstad, M. Wilson, E. Vine. 2003. *PIEREA Climate Change Research, Development, and Demonstration Plan.* California Energy Commission. PIER Environmental Area. Draft. February 19.

Giorgi, F., and L. O. Mearns. 2002. "Calculation of Average, Uncertainty Range, and Reliability of Regional Climate Changes from AOGCM Simulations via the 'Reliability Ensemble Averaging' (REA) Method." *Journal of Climate* 15: 1141–1158.

Houghton, J. T., Y. Ding, D. J. Griggs, M. Noguer, P. J. van der Linden, X. Dai, K. Maskell, and C. A. Johnson, eds. 2001. *Climate Change 2001. The Scientific Basis.* Cambridge: Cambridge University Press.

Leung, L.R., L. O. Mearns, F. Giorgi. R. L. Wilby. Regional Climate Research. Needs and Opportunities. Bulleting of the American Meteorological Society. 89-95. January 2003.

Research Topic 2

Enhanced Climate and Hydrological Monitoring for California

I. Background Information

Understanding and projecting changes in California's water resources, including hydropower generation, is critically dependent on building and maintaining a network of environmental observations in key areas of the state. In recent decades, streamflow records collected at relatively low elevation gauges suggest that an alarming change toward earlier snowmelt has been occurring in the Sierra Nevada, which may be an early indication of global warming or a result of natural fluctuations.

If this trend continues, as suggested by recent PIER supported research (Miller 2003), this earlier snowmelt might result in an increased danger of floods in the winter season, lower availability of water during the summer, and less reliable hydropower production. However, the data needed to detect and understand these changes and to improve and evaluate hydrological models are scarce - to the point that many of the underlying hydrological processes simulated by these numerical models can only be inferred, reducing confidence in the model results. More reliable hydrological data and better models are needed to better estimate near and long-term impacts of climate change and to develop robust adaptation strategies for such change.

The Scripps Institution of Oceanography (Scripps), under an existing contract with PIER funding, is partially addressing this issue. Scripps is developing, installing, and operating a high-quality, low-cost, reliable, remote environmental monitoring system. This system is designed to measure key meteorological and hydrological parameters, such as snow cover, precipitation levels, wind velocity, humidity, temperature, solar radiation, and temperature. The system includes sensors and wireless communications technologies that are designed for low-maintenance operation, low energy consumption, and a small, unobtrusive footprint required for monitoring in mountainous watersheds. The system will transmit the data in real time or in near-real time via wireless connections to the Internet, and also provide a local storage capability that is tolerant to communication failures, ensuring that data gaps can be recovered. Scripps is currently installing these monitors in Yosemite National Park and the Santa Margarita watershed in San Diego County. In the near future, they will start installing them in the Sierra transect from Sacramento to Reno. However, given staff and resource limitations at Scripps, other institutions must participate in this effort.

Some of the areas in need of enhanced monitoring in the state include additional mountain zones (foothills to crests), and transects from the coastal areas to nearby interior regions. The monitoring in mountain transects is needed because: (1) as a system they are not very well monitored, (2) climate changes would presumably produce great changes in higher elevations, (3) some elements, such as snow accumulation, snowmelt and possibly precipitation could change quite markedly along these transects; and (4) there would be great consequences because these regions are the most important source of the State water supply and hydropower generation. Monitoring in coastal to inland transects is needed to detect changes in temperature, cloud cover, winds, and coastal fog, and other variables. This is the region where most

Californians live, and any changes there would have significant impact on energy demand, health, recreation, and commerce.

II. Project Description

The purpose of this research topic solicitation is to enhance the work already done by Scripps by installing and maintaining additional modern wireless meteorological and hydrological monitoring sites at other key locations and/or additional sensors that sample additional monitoring variables. The proposal could also include the development of novel methods to collect, store, transfer, and access monitored variables. This work is needed as soon as possible to gather the data that will be used in the future for the evaluation of regional climate models. This project involves the following steps:

1. Identifying key areas where monitors should be installed and which parameters should be measured, with an explanation for their purpose;
2. Selecting and installing instrumentation in coordination with the ongoing work being executed by Scripps;
3. Installing communication systems to enable the transfer of data in real time or in near- real time, via wireless connections to the Internet;
4. Operating the stations and transmitting the data to a central archive at the Western Regional Climate Center in Reno, Nevada; and
5. Analyzing the collected data to ensure that it serves the purpose for which it is being collected.

The proposal should include a preliminary discussion of steps 1 and 2 listed above, but the selection of the actual sites and parameters will be based on input from PIER, Scripps, and other state and federal agencies interested in this work. However, if a proposal is contingent upon the installation of some of these monitors in areas owned or managed by the institution submitting the proposal, the proposal should include an in-depth discussion on how the instrumentation of these sites would achieve the overall goal of this project.

III. Relevance to the PIER Program

The data collected under this project will have multiple applications, such as the enhancement and evaluation of regional climatic and hydrological models, which will be used to improve the management of water resources (including hydropower production) and to better estimate the potential impacts of a changing climate. Presently, the lack of data at adequate geographical and temporal resolutions is hampering the proper evaluation of regional climate models.

IV. Project Term

Five years.

V. Maximum Amount of Funds Available

Total of $400,000 for five years.

VI. Matching Funds and/or Shared Costs

PIER funds should be seen as seed funds. Proponents are encouraged to provide matching funds and/or to share costs. The shared costs could be in the form of existing environmental monitoring networks and/or research programs that can be enhanced and tailored to produce the deliverables required for PIER. Please include a brief write-up of any existing or potential matching funds and/or shared costs in the Budget Narrative section of the grant application (Form C – Item L) – indicate if the funds/costs are existing or potential.

Also, the proponents must be willing to operate the monitors after the termination of the grant program with the Commission, as long as the monitoring systems continue to provide useful data. The applicant should provide convincing reasons of why the continued operation of the monitoring systems is in agreement with the overall objectives of their respective institutions.

VII. References

Franco, G., R. Wilkinson, A. H. Sanstad, M. Wilson, E. Vine. 2003. *PIEREA Climate Change Research, Development, and Demonstration Plan.* California Energy Commission. PIER Environmental Area. Draft. February 19.

Miller, N. L., K. E. Bashford, and E. Strem. 2003. *Appendix VIII: Climate Change Sensitivity Study of California Hydrology. In* Global Climate Change and California: Potential Implications for Ecosystems, Health, and the Economy. Draft Final Report. February 10.

Roos, M. 2002. *The Effects of Global Climate Change on California Water Resources.* Attachment II to Franco, G., R. Wilkinson, A. H. Sanstad, M. Wilson, E. Vine. 2003. *PIEREA Climate Change Research, Development, and Demonstration Plan.* California Energy Commission. PIER Environmental Area. Draft. February 19.

Research Topic 3

Decision Analysis under Risk and Uncertainty for Climate Change and Greenhouse Gas Policy in California

I. Background Information

Developing policies for addressing the potential impacts of climate change in California, as well as for the long-run abatement of greenhouse gases (GHGs) in the state, requires confronting a host of fundamental uncertainties. At the global level, future pathways of the climate system cannot be predicted exactly, and continued scientific research can be expected only to narrow, not eliminate, uncertainty regarding the behavior of the climate system and its impact on natural and human systems. This problem is exacerbated at the regional level, where the global uncertainty is amplified and the theoretical and empirical tools for projecting climate change at smaller spatial scales are at an even earlier stage of development. Correspondingly, estimating the long-run costs and benefits of policies to abate GHGs, whether at the international, national, or regional levels, is also subject to manifold uncertainties regarding the future course of such factors as technology, institutions, and energy demand. Overall, the uncertainties associated with climate change make decision-analysis under risk and uncertainty (hereafter, 'decision analysis') an appropriate approach to climate change policy and economic analyses.

To-date, however, most policy studies on global climate change – whether focused on impact and adaptation analysis or on GHG mitigation – have eschewed systematic consideration of risk and uncertainty. This reflects both the technical difficulties involved and the pedigree of the theoretical and empirical methods most commonly applied to climate or GHG policy studies, including the standard deterministic "integrated assessment" models typically used to conduct cost-benefit analysis in the climate context. While practical applications of decision analysis to climate and GHG policy are thus far relatively limited, however, there are theoretical and empirical decision analysis methods that are appropriate, in principle, for this area. Applying decision analysis to study different policy strategies and options and their associated benefits and costs – as well as critical vulnerabilities, will be useful in informing policy and decision makers responsible for addressing climate change and GHG mitigation in California.

II. Project Description

The project will be a case study applying quantitative decision analysis to a problem associated with climate change impacts or adaptation, or GHG mitigation, in California. For this case study, PIER will consider a range of specific GCC topic areas, including, but not limited to, those specifically related to climate change impacts on California's electric power system. Examples are carbon sequestration, biodiversity and other ecological impacts, end-use demand for energy, hydroelectric power, ecosystems, water quality, sea-level rise, and technological change in the energy system.[2]

[2] In its program of research on the economics of climate change and GHG mitigation in California, PIER is currently planning – in work to be conducted at the University of California at Berkeley (Berkeley) – to study the characteristics

A key element of the context for this research is that determining probabilities of specific potential trajectories for the regional climate is, as yet, an unsolved problem (and will be the subject of ongoing PIER research). Similarly, socio-economic impacts of climate change, as well as costs of GHG mitigation, are likely to be contingent upon future paths of economic and social variables which either cannot be assigned numerical likelihoods or for which such assignments are controversial. For these reasons, PIER is particularly interested in research applying alternatives to classical decision theory (although conventional risk analyses will also be considered where these are appropriate). Thus, Bayesian approaches may be appropriate in specific instances, but PIER will also consider research based on non-probabilistic methods. An approach of particular interest is to identify "thresholds" in socio-economic or natural systems – that is, costly non-linear responses that might be triggered by climate change – and to carry out "inverse" analysis in which the economic and other risks associated with such thresholds are related to existing projections of potential changes in regional climate. The purpose of such an approach is to identify, in a decision-analytic context, critical vulnerabilities and relate them to potential climate changes. In addition, PIER is interested in identifying cases in which policies to address such climate-related vulnerabilities may also serve other environmental policy goals – so-called "no regrets" policies.

The specific aim of the case study will be to determine, in the context of a specific policy problem, a robust, adaptive strategy for addressing (through adaptation or amelioration) climate change impacts or undertaking GHG emission abatement. This terminology refers to policy strategies with two characteristics: A) A high, although not certain, probability of success across a wide range of as-yet-unknown realizations of relevant variables, and B) amenability to dynamic updating as new information is acquired and uncertainty is reduced. The study should encompass theoretical, empirical, and computational aspects, drawing both on the literature related to climate change and as appropriate on the broader literature on environmental-economic risk assessment.

This work will be carried out in consultation with researchers at PIER's California Climate Change Research Center (CCCRC) at Berkeley and Scripps, PIER staff, representatives of other California state agencies, and other selected organizations.

Proposals should contain the following elements:

1. *Policy Problem Case Study and Decision Analysis Methodology:* (A) The case study to be analyzed should be clearly stated and discussed. The proposals should identify and explain: 1) the GCC topic area to be analyzed and its potential significance; 2) the policy-relevant risk(s) (critical vulnerabilities) associated with addressing the GCC topic area; 3) the GCC topic area characteristics and risks that make it an appropriate case study for decision analysis (such as the nature of the uncertainty involved); and 4) the potential benefits for California policy/ decision makers and research managers that may result from the study. This discussion should include a

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and implications of uncertainty and economic risk in water reliability related to climate change in California as well as spatially-disaggregated, long-range trends in urban water and energy demand incorporating uncertainty. Therefore, neither of these topic areas will be considered in this solicitation.

review of other relevant theoretical and empirical research, and policy applications. As appropriate, it should also include a discussion of the nature and socio-economic significance of threshold phenomena (as noted above) entailed by the problem.
(B) The decision-analytic method to be applied should be explained and justified. If probability-based risk calculations will be performed, the sources of probabilistic information should be described. Alternatively, the proposal should include a discussion and justification of relevant non-probability-based (methods that the project will apply). In addition, the approach to defining and calculating robust adaptive strategies for the problem in question should be thoroughly described.
(C) The empirical sources for the proposed analysis should be reviewed.
(D) Software requirements for conducting the analysis should be reviewed.

2. *Proposed Technical Analysis:* Applicants should describe how the technical work of the project would be carried out. This section of the proposal should consist essentially of a summary of how the theoretical framework, empirical resources, and software and/or computational tools discussed in item 1 above will be brought to bear in the case study. While the details of the analysis will depend upon the exact nature of the problem to be studied, this part of the proposal should include a discussion of how quantitative policy implications will be derived from the analysis.

3. *Assessment of Institutional Feasibility*: The broad aim of the PIER program is to provide California policy-makers with improved scientific and economic tools for addressing climate change and GHG mitigation. Potential applications of decision analysis, to be successful, would need to be well-integrated into the current agency processes for policy analysis. To the extent possible (depending on the nature of the case study), proposals should indicate how the methods applied in the research or the research results or both could be applied in practice by state decision-makers, and what steps would be required to facilitate such application. (It is expected that researchers would study, in consultation with PIER staff, what institutional hurdles might affect adoption of these methods, and the costs and benefits of overcoming them. This effort would be expected to include interviews with staff of California state agencies; it would also include, in selected cases, examination of the "legacy" problem: how to incorporate in decision analysis existing modeling capabilities developed for other forms of analysis.)

III Relevance to the PIER program

PIER is making a substantial investment in improving the scientific, economic and policy tools needed for formulating climate impact and adaptation, and GHG mitigation, policy in California. Virtually every aspect of the various policy problems posed by climate change involve uncertainty of one or another form. In this environment, the concept of robust adaptive strategies, as defined above, is a suitable way of framing the goal of policy analysis. The work described here would be a crucial component of reaching this goal.

IV. Project Term

1 year.

V. Maximum amount of funds available

$100,000

VI. Matching Funds and/or Shared Costs

PIER funds will be available to carry out the specific work described in this document, and matching funds from other sources, or cost sharing, are encouraged but not formally required. Additional funds or cost sharing could be used to perform some additional numerical experiments, collect data, or perform additional more in-depth analyses. Please include a brief write-up of any existing or potential matching funds and/or shared costs in the Budget Narrative section of the grant application (Form C - Item L) - indicate if the funds/costs are existing or potential.

Research Topic 4

Enhancement and Evaluation of Dynamic Vegetation Models for California

I. Background Information

California has a highly diverse landscape that ranges from cool, wet redwood forests in Northern California to hot, dry Mojave and Colorado deserts of Southern California, with many variations in between. As a result, California hosts more plant and animal species than any other state. Across the state, these species reside in approximately 300 natural plant and animal communities, 178 major habitat types (Schoenherr 1992), ten broad biological categories, or "bioregions" based on distinct and consistent climate zones, and 10 floristic provinces that are further divided into 24 sub-provinces (Hickman 1993). In the state, there are 5,057 native and nearly 1,000 exotic plant species and almost 1,000 native vertebrate species including 540 birds, 214 mammals, 77 reptiles, 47 amphibians and 83 freshwater fishes (Schoenherr 1992).

This rich abundance of flora and fauna is already threatened by forces such as land-use changes, invasive species, and air and water quality degradation. Climate change impacts, largely a result of unabated greenhouse gas (GHG) emissions, will intensify these threats through increases in temperature, changes in precipitation levels, potential increases in extreme rainfall events, runoff, and evaporation; as well as from changing ecosystems, changes in snowpack levels and soil moisture, and sea level rise (USGCRP 2001).

In California, 345.7 million metric tons of CO_2, a GHG, were released into the atmosphere during 1999. This included 55.3 million metric tons emitted in the course of electricity production in the state. However, more than this amount is emitted from out-of-state power plants serving California. Because energy production is a major contributor to GHG emissions, it is important that those engaged in state energy research and development investigate the effects of GHG emissions on state resources.

The PIER program funded two projects which applied a dynamic vegetation model to investigate the potential changes of vegetation patterns under different climatic scenarios in California[3]. Using climatic scenarios previously developed for PIER, the model employed mathematical formulas to explore how vegetation is likely to change over time and across different habitats. The model was applied to estimate the potential impact of climate change on: 1) California timber markets and 2) the costal sage scrub, which represents a specific ecosystem in California. The projects were useful in broadening our understanding and exploring possibilities of the potential effects of climate change on state resources.

The estimates of changes of vegetation patterns from existing dynamic vegetation models are not accurate enough to make solid assertions about likely impacts. Consequently, their results should be interpreted with caution. The reason for this is that existing models do not take into account important variables (drivers) that are of biological importance (including, but not limited

[3] Information about this model is available at the following web site: http://www.fsl.orst.edu/dgvm/. If you are interested in obtaining a copy of the model, contact the staff at the website.

to, an incorporation of plants, animals, and physical factors in a single, integrated model). Incorporation and interaction of these variables would greatly improve our ability to make accurate estimates of ecosystem changes in response to climatic shifts. Research must first be performed that better develops a model(s) which incorporates additional drivers, including: 1) land use characteristics, 2) age and spatial structure of plant *and* animal populations, 3) dispersal rates and modes of different species, and 4) the potential impacts of invasive species.

Fauna-wide models are only recently being used to estimate impacts from climate change (Peterson 2002). In order to produce more comprehensive ecosystem models, the work funded under this project should include estimations of how flora and fauna changes over time and across different habitats, as well as a consideration of the key drivers listed above.

PIER is soliciting proposals that will either enhance current models or develop more comprehensive ones to take into consideration multiple variables and to be able to project more robust projections regarding the plausible impacts of climate on various ecosystems under different climatic futures.

II. Project Description

The primary objective of this research is the development or enhancement of a modeling tool for assessing ecosystem impacts under a wide variety of climate scenarios in California. The application of the model will be the subject of a future phase of the proposed research program. The proposed model however, will be designed to overcome key limitations of existing models, by considering for example urban areas as barriers to migration of animals and vegetation. Incorporation of additional variables would greatly improve our ability to better understand potential ecosystem changes in response to climatic shifts.

Dynamic ecosystem models, as envisioned here, would provide additional insight into the impacts of climate change on biota, above and beyond dynamic vegetation models. Ecosystem models should incorporate both the interactions of plant and animal species, as well as the influences of the abiotic environment on ecosystems. Expansion and contraction of ecosystems should thus be modeled, taking into account a more complete assemblage of ecosystem residents and the surrounding physical environment. PIER's ultimate goal is to provide estimates as to how climate change may affect California's native ecosystems in the future.

Applicants can propose to add to existing models or to develop an entirely new model for this project. Whichever approach is chosen, the applicant will need to build upon the concepts previously employed with dynamic vegetation modeling and concepts and include crucial drivers of ecosystem dynamics that are not adequately addressed. For this solicitation, four drivers that deserve immediate attention are:

1. **Land use characteristics.** Existing models do not address the impacts of current land use, land use change, land cover fragmentation, and the history of land management on ecosystem dynamics. These elements are critical for understanding ecosystem structure and function in a changing world. It is necessary to know the trajectory of land use change for the model to produce realistic age structures for populations of plants and animals. Future land use will be a function of both human population growth and vegetation change. In addition, it will be

important to understand the distribution of the physical barriers to species migration that may be imposed by land use change, and, in particular, their impact on migration corridors.

2. **Age and spatial structure of vegetation** In current dynamic vegetation models, the spatially variable age structure of populations are simulated. Although there are efforts underway to compare modeled age structures with observed age structures, it is unknown how well the simulations replicate observed patterns. Because knowledge of the initial age structure of populations of organisms is important for understanding the trajectory of ecosystem structure, it will be advantageous to the success of future model predictions to accurately portray observed age structure at the onset of the model run, based on empirical studies in selected sample areas.

3. **Dispersal rates and modes of different species.** Dispersal rates and modes of different species are not considered in existing models. The models need to incorporate the varying dispersal abilities of species in California to adequately assess the impact of a changing climate on the community composition of California's ecosystems. Most likely, the inclusion of such information for all species would be cost-prohibitive, but it is essential that the models be able to incorporate information from at least a few key target species into the model runs with the goal of understanding species-level responses to future threats. For example, an incorporation of information on dispersal in both key plant and key animal species would be worthwhile seeing as these two categories of organisms face fundamentally different challenges to dispersal.

4. **Invasive species.** Existing models are not currently considering the impact of non-native, invasive species. The introduction and spread of invasive species can cause disruption in ecosystem's succession. Non-native species pre-adapted to disturbance could easily colonize altered sites before native species become established. Non-native species can alter disturbance regimes so that further establishment by native species is highly unlikely. For example, the spread of *Bromus tectorum,* a non-native invasive grass to western shrublands, alters the frequency of fires, which in turn suppresses the establishment of native shrubs. Mechanisms involving invasive species, therefore, have a tremendous potential for altering ecosystem structure. Any progress made toward incorporating species-specific dispersal traits from activity 3 above will aid this effort as well. The impact of introduced pest pathogens that cause such diseases as Sudden Oak Death should also be considered for incorporation into the new generation of models.

For each of the above areas, the researchers should test the models at different geographical and temporal scales.

This work should be heavily coordinated with field studies to incorporate new findings in the formulation of dynamic ecosystem models. Some of the PIER funds can be used to enhance key field studies conducted in the state.

This project should be seen as the foundation for additional work addressing issues such as the long-term viability of terrestrial carbon sequestration projects in California, which may become an important strategy in California for the reduction of net carbon dioxide emissions by companies reporting their emissions to the California Climate Action Registry

(http://www.climateregistry.org/). The dynamic ecosystem model developed or enhanced through this project will be used in the future with the different climate scenarios developed by other PIER research projects to estimate the changes to ecosystems and their services.

III Relevance to the PIER program

Changes in climate will affect the distribution and diversity of ecosystems at the global, national, and state levels. At the same time, these changes in ecosystems will affect the hydrological cycle and the climate itself. For example, changes in albedo may be as important as the climate forcing by greenhouse gases at the regional level (Dr. Margaret Torn, personal communication)[4]. Changes in ecosystem patterns, processes, and hydrology will, in turn, impact energy demand and the availability of hydropower. Future applications of this model, will allow PIER to estimate, among other things, the impact of climate change on ecosystems, the long-term viability of forestry carbon sequestration projects, the changes in the frequency and severity of forest fires, and the potential impact of changes of vegetation on regional climate.

This project is connected to other potential PIER projects dealing with the potential impact of climate change in forested areas, the carbon budget in California lands and its impacts in the state wide inventory of greenhouse gases, forest fires, and ecosystems impacts. Ideally this model or a reduced form of this model should be used with regional climate models to study the link and feedback between climate and the biosphere.

IV. Project Term

Three years.

V Maximum amount of funds available

Total of $600,000 over three years.

VI. Budget Note

Applicants should indicate what percentage of the budget will be spent on modeling, and what percentage on fieldwork. This can be done using Form C-2 – the task level budget.

VII. Matching Funds and/or Shared Costs

PIER funds should be seen as seed funds because they may not be enough to cover the general area of work described in section II and, for this reason, proponents should already have matching funds and/or shared costs available. The shared costs could be in the form of existing

[4] Climate forcing refers to atmospheric modifications that 'force' the climate to change (e.g. increased concentrations of atmospheric greenhouse gases are generally assumed to warm the atmosphere). However, changes in the albedo of surface vegetation can also directly affect climate and hydrology. Albedo refers to the ability of a surface to reflect radiant energy. Changes to surface vegetation (by modifying species composition or structural characteristics) can modify the ability of vegetation to reflect radiant energy and thus alter the amount of radiation that reaches the underlying soil. This, in turn, will influence the amount of energy that is absorbed by the ground and re-radiated to the atmosphere as long-wave radiation. It is this re-radiated long-wave energy that is trapped by greenhouse gases and contributes to climatic warming.

strong experimental and modeling research programs that can be enhanced and tailored to produce the deliverables required for PIER. Please include a brief write-up of any existing or potential matching funds and/or shared costs in the Budget Narrative section of the grant application (Form C – Item L) – indicate if the funds/costs are existing or potential.

VIII. References

Franco, G., R. Wilkinson, A. H. Sanstad, M. Wilson, E. Vine. 2003. *PIEREA Climate Change Research, Development, and Demonstration Plan.* California Energy Commission. PIER Environmental Area. Draft. February 19.

Hickman, J. C., ed. 1993. *The Jepson Manual: Higher Plants of California.* Berkeley: University of California Press.

Natural Community Conservation Planning Web site. 2003. www.dfg.ca.gov/nccp/

Peterson, A. T., M.A. Ortega,-Huerta, J. Bartley, V. Sanchez-Cordero, J. Sobrerón, R. H. Buddemeir, D. R.B. Stockwell. Future projections for Mexican faunas under global climate change scenarios. Nature. 416: 626-629.

Schoenherr, A. A. 1992. *A Natural History of California.* Berkeley: University of California Press.

Shaw, Rebecca. 2002. *Ecological Impacts of a Changing Climate.* Attachment III to Franco, G., R. Wilkinson, A. H. Sanstad, M. Wilson, E. Vine. 2003. *PIEREA Climate Change Research, Development, and Demonstration Plan.* California Energy Commission. PIER Environmental Area. Draft. February 19.

Margaret Torn/Lawrence Berkeley National Laboratory. 2003. Personal communication.

USGCRP. 2001. *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change.* Overview: Our Changing Nation. U.S. Global Climate Change Research Program.

Appendix 1. Technical Evaluation Criteria

Points 0-10

1. Degree to which the research proposal accurately and completely responds to the specific overall scope of work as described in one of the relevant Research Topics. The proposal completely and accurately responds to the specific overall scope of work as described in one of the relevant Research Topics.	**Weighting Factor: 1.5** **Possible Points: 15**

2. Degree to which applicant clearly identifies available and existing matching funds and/or cost sharing to supplement Commission funds and degree to which these funds clearly contribute to the overall robustness of the project (Budget Forms C-1 & C-2 and Item L). The proposal lists and describes the availability of existing matching funds and/or cost sharing. The matching funds and/or cost sharing clearly contribute to the overall robustness of the proposal.	**Weighting Factor: 1.0** **Possible Points: 10**

3. Degree to which applicant clearly identified plans for obtaining new funds and/or cost sharing to supplement this proposal and the degree to which these funds would clearly contribute to the overall robustness of the project (Budget Forms C-1 & C-2 and Item L). The proposal clearly describes plans for obtaining supplemental funds.	**Weighting Factor: .5** **Possible Points: 5**

4. Degree to which the proposed research identifies clear, meaningful, and measurable objectives. The proposal lists and describes clear, meaningful, and measurable objectives that will achieve the tasks required in addressing the relevant Research Topics. The research methods are appropriate for achieving the project's objectives and goals.	**Weighting Factor: 1.5** **Possible Points: 15**

5. The Project Narrative (Section 3.4), Products and due dates (Section 3.4, Item 3), Budget Narrative and Budget Forms (Section 3.6, and Forms C1-C-2) are reasonable, appropriate and demonstrate that there is a high probability of project success. The Project Narrative and Task Budgets demonstrate a clear, reasonable, appropriate and complete effort. The Project Narrative and Task Budgets are composed of a series of interconnected, logical, and discrete tasks. The Project Narrative and Task Budgets lays out an approach and plan that is practical and feasible for accomplishing the stated objectives. The Work Schedule reasonably appropriates time and funds with respect to the sequences of tasks, level of effort allocated per task, and the use of labor, equipment, and facilities. If the research involves a particular environmental aspect – the schedule fits the necessary time of year to conduct the research. Each item (Form C – Items A-M) of the budget is appropriate considering: (1) the significance of the barriers, issues, and/or knowledge gaps being addressed, (2) the project's objectives and goals, and (3) the level of effort described in the Project Narrative. The budgets show that key personnel will be committed to the project for the appropriate number of hours and functions to accomplish the tasks and deliverables, and the activities described in the Project Narrative.	**Weighting Factor: 2.0** **Possible Points: 20**

6. The Principal Investigator and the Project Team are well qualified to conduct the project (Form D). The applicant describes in detail, with substantiation, his or her past and current work in the research subject area. Accomplishments (not just activities) are described. The applicant describes in detail their success in working with other teams. The proposal demonstrates the applicant's awareness of current and prior work by others in the proposed research area. The proposal convincingly demonstrates, based on education, training and past experience, that the applicant and project team are capable of conducting all technical, administrative, and budgetary functions and responsibilities, including the ability to control cost, maintain the schedule, and report results and accomplishments in an effective manner. Degree to which the proposal is clearly written and internally consistent.	**Weighting Factor: 1.5** **Possible Points: 15**

7. Overall technical merit and degree to which the project is likely to succeed. Taking all factors into consideration, including those cited above, the overall technical merit of the proposal. To the reviewer's understanding, the likelihood that this project is feasible and is likely to succeed.	**Weighting Factor: 2.0** **Possible Points: 20**

Total Technical Reviewer Points:	

Appendix 2. Global Climate Change Technical Review Committee Evaluation Criteria

	Points 0-10
1. Degree to which the research proposal responds to the specific overall scope of work as described in one of the relevant Research Topics. The proposal clearly responds to the Research Topic.	**Weighting Factor: 1.5** **Possible Points: 15**
2. Degree to which the proposed research identifies clear, meaningful, and measurable objectives. The proposal lists and describes clear and measurable objectives that will achieve the tasks required in addressing the relevant Attachments. The research methods are appropriate for achieving the project's objectives and goals.	**Weighting Factor: 1.0** **Possible Points: 10**
3. The Principal Investigator and the Project Team are well qualified to conduct the project (Form D). The applicant describes in detail, with substantiation, his or her past and current work in the research subject area. Accomplishments (not just activities) are described. The applicant describes in detail their success in working with other teams. The proposal demonstrates the applicant's awareness of current and prior work by others in the proposed research area. The proposal convincingly demonstrates, based on education, training and past experience, that the applicant and project team are capable of conducting all technical, administrative, and budgetary functions and responsibilities, including the ability to control cost, maintain the schedule, and report results and accomplishments in an effective manner. Degree to which the proposal is clearly written and internally consistent.	**Weighting Factor: 1.0** **Possible Points: 10**
4. Overall merit, including a consideration of the degree to which the proposal goes beyond the basic requirements described in the relevant Attachment and the availability of matching funds. The proposal is original and addresses the issue in the Research Topic To the reviewer's understanding, the likelihood that this proposal is feasible and is likely to succeed.	**Weighting Factor: 1.5** **Possible Points: 15**
Total Technical Review Committee Points:	

Appendix 3. Sample Non-Disclosure Form

It is the responsibility of the Global Climate Change (GCC) Grant Program Administrator to safeguard all confidential/ proprietary information contained in documents submitted to the GCC Grant Program. To fulfill this responsibility, the GCC Administrator requires all personnel who process, screen, and review GCC Program documents (pre-proposals, proposals, final reports) that contain confidential information, to complete a non-disclosure agreement with the GCC Administrator.

By signing this agreement the GCC Program Administrator (hereafter referred to as the GCC PA) and the program support personnel granted access (hereafter referred to as the RECIPIENT) agree to abide by the following terms and conditions.

1. GCC PA's Obligation: The GCC PA agrees to clearly identify those documents containing confidential/proprietary information and to identify those sections within the documents that are considered confidential/proprietary by the grant applicant which may include any or all of the following: data, materials, designs, concepts, processes, samples, specifications and financial or business information.

2. RECIPIENT' Obligations: RECIPIENT agrees to take all such precautions as may be reasonably necessary to prevent the disclosure of all confidential/proprietary information contained in GCC Program documents. In addition, the RECIPIENT agrees to the following:
   (a) Shall not make or retain copies of confidential information contained in GCC Program documents (excluding the GCC PA).
   (b) Shall not disclose confidential information to any third party unless the disclosure is necessary in the performance of their GCC Program responsibilities, in which case, the new RECIPIENT granted access must also sign a non-disclosure agreement.
   (c) Shall not use the confidential information for personal benefit.

3. Limitation on Obligations: The obligations specified in section 2 above do not apply to information that meets the following conditions:
   (a) Information already known or independently developed by the RECIPIENT (in documented form) prior to this disclosure by the GCC PA.
   (b) Information previously published or in the public domain.
   (c) Information that becomes public knowledge or is legally disclosed by third parties after this agreement is executed.

4. The term of this agreement shall be five (5) years from the date of access to any GCC Program document containing confidential/proprietary information.

5. This agreement shall be governed and construed in accordance with the laws of the State of California.

AGREED AND ACCEPTED BY:

RECIPIENT	**GLOBAL CLIMATE CHANGE GRANT PROGRAM ADMINISTRATOR**
Signature & Date:	*Signature& Date:*
Printed Name:	*Printed Name*:
Address:	*Address*:
Document Covered By This Agreement:	

EXHIBIT A
Sample Work Statement
PIER-EA Grant Programs
Work Authorization MR-00X

GLOSSARY
Specific terms and acronyms used throughout this work statement are defined as follows:

Acronym	*Definition*
	*(*Insert additional rows as needed.*)*

Problem Statement
Describe the problem that this research will address.

GOALS AND OBJECTIVES

The goal of this project is to…(*Complete the sentence with a brief description of the goal(s). Goals can be technical, economic or social. Please be brief, two to three sentences maximum*.)

This project meets the PIER Goal of <pick one from the list below> by <fill in the blank>. (If applicable, this project also meets the secondary goal of <pick one from the list below> by <fill in the blank>.)

1 PIER Goals
1. Improving the Energy Cost/Value of California's Electricity
2. Improving the Environmental and Public Health Costs/Risk of California's Electricity
3. Improving the Reliability/Quality of California's Electricity
4. Improving the Safety of California's Electricity

The objectives of this project are to…(*Complete this sentence with the objectives, which are things that will be measurable or knowable at the end of **this** project.*)

Examples of Performance Measures:
- . . .reduce the cost of electricity generation (or supply) by ____%.
- . . .increase the number of new technologies that are market-ready by ____<fill in the number>.
- . . . increase the adoption by the market of specific technologies by ___%.
- . . . increase the renewable technologies that are cost competitive by __%.
- . . . increase the new energy systems that can use multiple fuels by ____%.
- . . . decrease end-use consumption in specific energy sectors.

- . . . decrease the system impacts over current best practices by ____%.
- . . .increase the number of market-ready technologies that contribute to reduced risks of increased environmental/health impacts by ____<fill in the number>.
- . . .reduce the interruption frequency and duration per customer type per year by ____<fill in the number>.
- . . .increase the expected number of new technologies providing increased reliability/quality choices to consumers by ____<fill in the number>.
- . . .decrease the rates of injury and fatality associated with electricity generation/supply and usage by ____<fill in the number>.
- . . .determine the effectiveness of the XYZ process.

ADMINISTRATION

MEETINGS

Task 1.1 Attend Kick off Meeting
Task 1.2 Critical Project Review Meetings (To be determined for PIER-EA Grants)
Task 1.3 Final Meeting
Task 1.4 Progress Reports
Task 1.5 Test Plans, Technical Reports and Interim Deliverables
Task 1.6 Final Report
Task 1.6.1 Final Report Outline
Task 1.6.2 Final Report
Task 1.6.3 2-page Final Project Summary

PERMITS AND ELECTRONIC FILE FORMAT

Task 1.7 Identify and Obtain Required Permits
Task 1.8 Electronic File Format

Refer to Attachment A-1 for the details of Administration

TASK 2.0 TECHNICAL TASKS

The project's work scope involves the following technical tasks:

Task 2.1 (*Insert Task Name*)
Task 2.2 – 2.n-2 (*Insert Task Name*)
Task 2.n-1 Technology Transfer Activities *(If applicable)*
Task 2.n Production Readiness Plan *(If applicable)*

Technical Task Descriptions

The work effort should be divided into a series of logical, discrete and sequential tasks. Technical tasks start with the number 2.1**. Please use the following pattern for each technical task.**

Task 2.1 (*Insert Task Name*)
The goal of this task is to . . .(*Complete the sentence by inserting a **brief** description that identifies the expected result(s) and accomplishments for this task. The description should be 2 to 3 sentences maximum. Use a consistent naming convention throughout the work statement. For example, the name "photovoltaic system" is not the same as the name "solar electric generation alternative." Pick one name and stick with it throughout.)*

Successful completion of this task will be measured by…(*Complete the sentence by listing the performance measure(s) or other criteria that will be used to evaluate the results and to determine to what degree the goal was achieved.*)

Meeting this goal helps to achieve the project objectives by… *(Complete the sentence.)*

The Performing Institution shall:

- *(Insert verb in active tense) . . . (Complete the sentence.)*
- *(Insert verb in active tense) . . . (Complete the sentence.)*

(*List each individual **activity** with a separate bullet and begin each bullet with a verb to continue the sentence beginning with "The Performing Institution shall." Organize activities in the order in which they will occur. A bullet needs to appear before each activity. Use this section to describe the essential elements of **the process** you will use to complete the project.*

*The contents of each **deliverable** shall also be described in this section. Only the **names** of each deliverable shall appear in the "Deliverables" section. Use exactly the same name to identify a deliverable (report, data set, project plan, etc.) in the activity and in the list of deliverables. A bullet needs to appear before each deliverable.*

Deliverables are products that incorporate the knowledge and understanding gained by performing the activities and that are submitted to the Commission for review, comment and approval. Deliverables include, but are not limited to, written reports that describe methods, test plans, results of testing, analysis of data, conclusions, and recommendations for future study, workshop agendas and summaries, description and photographs of equipment/product developed, summaries of advisory group meetings, computer software with written instructions for data input and use of the software, if intended for public or Commission use, and production prototypes. The sum of the deliverables should be sufficiently detailed to be of use to stakeholders and other researchers. The level of detail should be sufficient for an observer to assess whether the project objectives and goals have been successfully met.

Deliverables:

- 1st deliverable (name only)
- 2nd deliverable (name only)

(*List deliverables using the same name and in the order that they appear in "The Performing Institution shall" section. Only the deliverable name should be listed here. The contents of each deliverable shall be described in "The Performing Institution shall" section.)*

Key Personnel:

<fill in the name(s)>

(Name of key person for this task that works for the Performing Institution. If none, state none.)

Key Subcontractors:

<fill in the name(s) and/or company(ies)>

(*Name of key company or name of key person at key company for this task. If none, state none.)*

Task 2.2 – 2.n-2
(Repeat the process as shown above)

Task 2.n-1 Technology Transfer Activities (Technology Transfer activities for the PIER-EA Grant program will be in the form of Progress Reports, Final Report, and Project Summaries).
The goal of this task is to develop a plan to make the knowledge gained, experimental results and lessons learned available to decision-makers in industry and government.

If this task is applicable, the Performing Institution shall:

- Prepare a Technology Transfer Plan. The plan shall explain how the knowledge gained in this project will be made available to the public. The level of detail expected is least for research-related projects and highest for demonstration projects. Key elements from this report shall be included in the Final Report for this project.

- Submit the draft Technology Transfer Plan to the Commission Project Manager for review and comment. Once agreement on the draft plan has been reached, the final plan shall be submitted to the Commission Project Manager for written approval, which shall be provided within 5 working days of receipt.

- Conduct technology transfer activities in accordance with the Technology Transfer Plan. These activities shall be reported in the Monthly Progress Reports.

Deliverables:

- Draft Technology Transfer Plan
- Final Technology Transfer Plan

Key Personnel:
<fill in the name(s)>
(Name of key person for this task that works for the Performing Institution. If none, state none.)

Key Subcontractors:
<fill in the name(s) and/or company(ies)>
(*Name of key company or name of key person at key company for this task. If none, state none.)*

Task 2.n Production Readiness Plan *(If applicable)* (To be determined for PIER-EA Grants)
The goal of the plan is to determine the steps that will lead to the mass manufacturing of the technologies developed in this project.

If this task is applicable, the Performing Institution shall:

- Prepare a Production Readiness Plan. The degree of detail in the Production Readiness Plan discussion should be proportional to the complexity of producing the proposed product and its state of development. The plan shall include as appropriate but not be limited to:
- Identification of critical production processes, equipment, facilities, personnel resources, and support systems that will be needed to produce a commercially viable product;
- Internal manufacturing facilities, as well as supplier technologies, capacity constraints imposed by the design under consideration, identification of design critical elements and the use of hazardous or non-recyclable materials. The product manufacturing effort may include “proof of production processes”;
- A projected “should cost” for the product when in production;
- The expected investment threshold to launch the commercial product;

- An implementation plan to ramp up to full production.
- Submit the draft Production Readiness Plan to the Commission Project Manager for review and comment. Once agreement on the draft plan has been reached the final plan shall be submitted to the Commission Project Manager for written approval, which shall be provided within 5 working days of receipt.

Deliverables:

- Draft Production Readiness Plan
- Final Production Readiness Plan

Key Personnel:
<fill in the name(s)>
(Name of key person for this task that works for the Performing Institution. If none, state none.)

Key Subcontractors:
<fill in the name(s) and/or company(ies)>
(*Name of key company or name of key person at key company for this task. If none, state none.)*

Exhibit (A-1)

ADMINISTRATION

MEETINGS

Task 1.1 Attend Kick-off Meeting
The goal of this task is to establish the lines of communication and procedures for implementing this Agreement.

The Principal Investigator shall:

- Attend a "kick off" meeting with the Commission Project Manager. This meeting may be by phone or in person as appropriate and as time permits. When necessary, the Commission Project Manager may request others to participate in the meeting including the Commission Contract Manager, and a representative from the Performing Institution's Contracts and Grants Office. The technical and administrative aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the Commission Project Manager will provide an agenda to all potential meeting participants.

  The administrative portion of the meeting shall include, but not be limited to, the following:
  - Roles and responsibilities of both parties
  - Budget changes
  - Invoicing
  - Prior approvals for travel and equipment
  - Confidential deliverables
  - Intellectual property
  - Critical Project Reviews (Task 1.2) (To be determined for PIER-EA Grants)
  - Permit documentation (Task 1.7)
  - Electronic File Format (Task 1.8)
  - Establish the PAC (Task 1.10) (optional) (To be determined for PIER-EA Grants)
  - PAC Meetings (Task 1.11) (optional) (To be determined for PIER-EA Grants)

  The technical portion of the meeting shall include, but not be limited to, the following:
  - The Commission Project Manager's expectations for accomplishing tasks described in the Scope of Work;
  - An updated Schedule of Deliverables
  - An updated Gantt chart if applicable
  - Progress Reports (Task 1.4)
  - Technical Deliverables (Task 1.5)
  - Final Report (Task 1.6)
  - Final 2-page Project Summary (Task 1.6)

The Commission Project Manager shall designate the date and location of this meeting.

Deliverables:
- An Updated Schedule of Deliverables
- An Updated Gantt Chart
- An Updated List of Permits
- Schedule for Recruiting PAC Members (optional)

Task 1.2 Critical Project Review Meetings
The goal of this task is to determine if the project should continue to receive Commission funding to complete this Agreement and if it should, are there any modifications that need to be made to the tasks, deliverables, schedule or budget.

Critical Project Reviews provide the opportunity for frank discussions between the Commission and the Performing Institution. CPRs generally take place at key, predetermined points in the Agreement, as determined by the Commission Project Manager and as shown in the Technical Task List above and in the Schedule of Deliverables. However, the Commission Project Manager may schedule additional Critical Project Reviews as necessary, and, if necessary, the budget will be reallocated to cover the additional costs borne by the Performing Institution.

Participants include the Commission Project Manager and the Performing Institution, and may include the Commission Contract Manager, the Commission Contract Officer, the PIER Program Team Lead, other Commission staff and Management as well as other individuals selected by the Commission Project Manager to provide support to the Commission.

The Commission Project Manager shall:

- Determine the location, date and time of each Critical Project Review meeting with the Performing Institution. These meetings generally take place at the Energy Commission, but they may take place at another location.

- Send the Performing Institution the agenda and a list of expected participants in advance of each Critical Project Review. If applicable, the agenda shall include a discussion on both match funding and permits.

- Conduct and make a record of each Critical Project Review meeting. One of the outcomes of this meeting will be a schedule for providing the written determination described below.

- Determine whether to continue the project, and if continuing, whether or not to modify the tasks, schedule, deliverables and budget for the remainder of the Agreement, including not proceeding with one or more tasks. If the Commission Project Manager concludes that the project needs a formal amendment or that satisfactory progress is not being made and the project needs to be ended, these conclusions will be referred to the Commission's Research, Development and Demonstration Policy Committee for its concurrence.

- Provide the Performing Institution with a written determination in accordance with the schedule. The written response may include a requirement for the Performing Institution to revise one or more deliverables that were included in the Critical Project Review.

The Performing Institution shall:

- Prepare a Critical Project Review Memorandum for each Critical Project Review that discusses the progress of the Agreement toward achieving its goals and objectives. This memorandum shall be submitted along with any other deliverables identified in this Scope of Work. Submit these documents to the Commission Project Manager and any other designated reviewers at least 10 working days in advance of each Critical Project Review meeting.

- Present the required information at each Critical Project Review meeting and participate in a discussion about the Agreement.

Performing Institution Deliverables:
- Critical Project Review Memorandum(Memoranda)
- Critical Project Review deliverables identified in this Scope of Work

Commission Project Manager Deliverables:
- Agenda and a List of Expected Participants
- Schedule for Written Determination
- Written Determination

Task 1.3 Final Meeting
The goal of this task is to close out this Agreement.

The Principal Investigator shall:

- Meet with the Commission to present the findings, conclusions, and recommendations. The final meeting must be completed during the closeout of this Agreement.

  This meeting will be attended by, at a minimum, the Performing Institution, the Commission Contracts Officer, and the Commission Project Manager. The technical and administrative aspects of Agreement closeout will be discussed at the meeting, which may be two separate meetings at the discretion of the Commission Project Manager.

  The technical portion of the meeting shall present findings, conclusions, and recommended next steps (if any) for the Agreement. The Commission Project Manager will determine the appropriate meeting participants.

  The administrative portion of the meeting shall be a discussion with the Commission Project Manager and the Contracts Officer about the following Agreement closeout items:

  - Commission's request for specific "generated" data (not already provided in Agreement deliverables)
  - Need to document Performing Institution's disclosure of "subject inventions" developed under the Agreement
  - "Surviving" Agreement provisions, such as repayment provisions and confidential deliverables.

- Final invoicing and release of retention

- Prepare a schedule for completing the closeout activities for this Agreement.

Deliverables:
- Written documentation of meeting agreements and all pertinent information
- Schedule for completing closeout activities

REPORTING

Task 1.4 Progress Reports
The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the research objectives of this Agreement.

The Performing Institution shall:

- Prepare progress reports which summarize all Agreement activities conducted by the Performing Institution for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due to the Commission Project Manager within 5 working days after the end of the reporting period. Attachment A-1, Progress Report Format, provides the recommended specifications.

Deliverables:
- Quarterly Progress Reports

Task 1.5 Test Plans, Technical Reports and Interim Deliverables
The goal of this task is to set forth the general requirements for submitting test plans, technical reports and other interim deliverables. Unless described differently in the Technical Tasks,

The Performing Institution shall:

- Submit a draft of each deliverable listed in the Technical Tasks to the Commission Project Manager for review and comment in accordance with the approved Schedule of Deliverables. The Commission Project Manager will provide written comments back to the Performing Institution on the draft deliverable within 5 working days of receipt. Once agreement has been reached on the draft, the Performing Institution shall submit the final deliverable to the Commission Project Manager. The Commission Project Manager shall provide written approval of the final deliverable within 2 working days of receipt. Key elements from this deliverable shall be included in the Final Report for this project.

- Submit two copies of the final deliverable with the next invoice.

Task 1.6 Final Report
The goal of this task is to prepare a comprehensive written Final Report that describes the original purpose, approach, results and conclusions of the work done under this Agreement. The Commission Project Manager will review and approve the Final Report. The Final Report must

be completed on or before the termination date of the Agreement. Attachment A-2, Final Report Format, provides the recommended specifications.

The Final Report shall be a public document. If the Performing Institution has obtained confidential status from the Commission and will be preparing a confidential version of the Final Report as well, the Performing Institution shall perform the following subtasks for both the public and confidential versions of the Final report.

Task 1.6.1 Final Report Outline

The Performing Institution shall:

- Prepare a draft outline of the Final Report.

- Submit the draft outline of Final Report to the Commission Project Manager for review and approval. The Commission Project Manager will provide written comments back to the Performing Institution on the draft outline within 5 working days of receipt. Once agreement has been reached on the draft, the Performing Institution shall submit the final outline to the Commission Project Manager. The Commission Project Manager shall provide written approval of the final outline within 2 working days of receipt.

- Submit two copies of the final report outline with the next invoice.

Deliverables:
- Draft Outline of the Final Report
- Final Outline of the Final Report

Task 1.6.2 Final Report

The Performing Institution shall:

- Prepare the draft Final Report for this Agreement in accordance with the approved outline.

- Prepare a 2-page summary of the final project. The description should be written at a level that could be understood by the general public with sufficient information to stand on its own.

- Submit the draft Final Report and the 2-page Final Project Summary to the Commission Project Manager for review and comment. The Commission Project Manager will provide written comments within 10 working days of receipt.

  Once agreement on the draft Final Report and Summary has been reached, the Commission Project Manager shall forward the electronic version of this report to the PIER Technology Transfer Group for final editing. Once final editing is completed, the Commission Project Manager shall provide written approval to the Performing Institution within 2 working days.

- Submit one bound copy of the Final Report, and one copy of the 2-page Final Project

Summary with the final invoice.

Deliverables:
- Draft Final Report
- Final Report
- 2-page Final Project Summary

PERMITS AND ELECTRONIC FILE FORMAT

Task 1.7 Identify and Obtain Required Permits
The goal of this task is to obtain all permits required for work completed under this Agreement in advance of the date they are needed to keep the Agreement schedule on track.

Permit costs and the expenses associated with obtaining permits are reimbursable under this Agreement. Permits must be identified in writing before the Performing Institution can incur any costs related to the use of the permit(s) for which the Performing Institution will request reimbursement.

The Performing Institution shall:

- Prepare a letter documenting the permits required to conduct this Agreement and submit it to the Commission Project Manager at least 2 working days prior to the kick-off meeting:

1. If there are no permits required at the start of this Agreement, then state such in the letter.

2. If it is known at the beginning of the Agreement that permits will be required during the course of the Agreement, provide in the letter:
    - A list of the permits that identifies the:
        - Type of permit
        - Name, address and telephone number of the permitting jurisdictions or lead agencies
    - Schedule the Performing Institution will follow in applying for and obtaining these permits

- The list of permits and the schedule for obtaining them will be discussed at the kick-off meeting, and a timetable for submitting the updated list, schedule and the copies of the permit(s) will be developed. The implications to the Agreement if the permits are not obtained in a timely fashion or are denied will also be discussed. If applicable, permits will be included as a line item in the progress reports and will be a topic at Critical Project Review meetings.

- If during the course of the Agreement additional permits become necessary, then provide the appropriate information on each permit and an updated schedule to the Commission Project Manager.

- As permits are obtained, send a copy of each approved permit to the Commission Project Manager.

- If during the course of the Agreement permits are not obtained on time or are denied, notify the Commission Project Manager within 5 working days. Either of these events may trigger an additional Critical Project Review.

Deliverables:
- A Letter Documenting the Permits
- Updated List of Permits as They Change During the Term of the Agreement
- Updated Schedule for Acquiring Permits as It Changes During the Term of the Agreement
- A Copy of Each Approved Permit

Task 1.8 Electronic File Format
The goal of this task is to unify the formats of electronic data and documents provided to the Commission as contract deliverables. Another goal is to establish the computer platforms, operating systems and software that will be required to review and approve all software deliverables.

The Performing Institution shall:

- Deliver documents to the Commission Project Manager in the following formats:
- Data sets shall be in Microsoft (MS) Access or MS Excel file format.
- PC-based text documents shall be in MS Word file format.
- Documents intended for public distribution shall be in PDF file format, with the native file format provided as well.
- Project management documents shall be in MS Project file format.
- Request exemptions to software standardization in writing at least 90 days before the deliverable is submitted.

Deliverables:
- A Letter Requesting Exemption from Software Standardization (if applicable)

PROJECT ADVISORY COMMITTEE (Optional)

Task 1.9 Establish the Project Advisory Committee
The goal of this task is to create an advisory committee for this Agreement.

The PAC should be composed of diverse professionals. The number can vary depending on potential interest and time availability. The Contractor's Project Director and the Commission Contract Manager shall act as co-chairs of the PAC. The exact composition of the PAC may change as the need warrants. PAC members serve at the discretion of the Commission Contract Manager.

The PAC may be composed of qualified professionals spanning the following types of disciplines:

- Researchers knowledgeable about the project subject matter
- Members of the trades who will apply the results of the project (e.g. designers, engineers, architects, contractors, and trade representatives)

- Public Interest Market Transformation Implementers
- Product Developers relevant to project subject matter
- DOE Research Manager
- Public Interest Environmental Groups
- Utility Representatives
- Members of the relevant technical society committees

The purpose of the PAC is to:

- Provide guidance in research direction. The guidance may include scope of research; research methodologies; timing; coordination with other research. The guidance may be based on:
    - technical area expertise
    - knowledge of market applications
    - linkages between the contract work and other past, present or future research (both public and private sector) they are aware of in a particular area
- Review deliverables. Provide specific suggestions and recommendations for needed adjustments, refinements, or enhancement of the deliverables.
- Evaluate tangible benefits to California of this research and provide recommendations, as needed, to enhance tangible benefits.
- Provide recommendations regarding information dissemination, market pathways or commercialization strategies relevant to the research products.

The Performing Institution shall:

- Prepare a draft list of potential PAC members that includes name, company, physical and electronic address, and phone number and submit it to the Commission Contract Manager at least 2 working days prior to the kick off meeting. This list will be discussed at the Kick-off Meeting and a schedule for recruiting members and holding the first PAC meeting will be developed.
- Recruit PAC members and ensure that each individual understands the member obligations described below, as well as the meeting schedule outlined in Task 1.11.
- Prepare the final list of PAC members.
- Submit letters of acceptance or other comparable documentation of commitment for each PAC member.

Deliverables:

- Draft List of PAC Members
- Final List of PAC Members
- Letters of Acceptance, or Other Comparable Documentation of Commitment for Each PAC Member

Task 1.10 Conduct Project Advisory Committee Meetings
The goal of this task is for the PAC to provide strategic guidance to this project by participating in regular meetings or teleconferences.

The Performing Institution shall:
- Discuss the PAC meeting schedule at the kick-off meeting. The number of face-to-face meetings and teleconferences and the location of PAC meetings shall be determined in consultation with the Commission Contract Manager. This draft schedule shall be presented to the PAC members during recruiting and finalized at the first PAC meeting.
- Organize and lead PAC meetings in accordance with the schedule. Changes to the schedule must be pre-approved in writing by the Commission Contract Manager.
- Prepare PAC meeting agenda(s) with back-up materials for agenda items.
- Prepare PAC meeting summaries, including recommended resolution of major PAC issues.

Deliverables:
- Draft PAC Meeting Schedule
- Final PAC Meeting Schedule
- PAC Meeting Agenda(s) with Back-up Materials for Agenda Items
- Written PAC Meeting Summaries, Including Recommended Resolution of Major PAC Issues

Exhibit (A-2)

Sample Content and Format of Progress Reports

PROGRESS REPORT for
Project Title,
500-02-004, WA# MR-00X
Date, 2003
Contractor Project Manager:
Commission Project Manager:

What we planned to accomplish this period
[This is taken directly from the section on "What we expect to accomplish during the next period" from the last progress report]

What we actually accomplished this period
[Concise description of major activities and accomplishments.]

How we are doing compared to our plan
[Explain the differences, if any, between the planned and the actual accomplishments. Describe what needs to be done, if anything, to get back on track.]

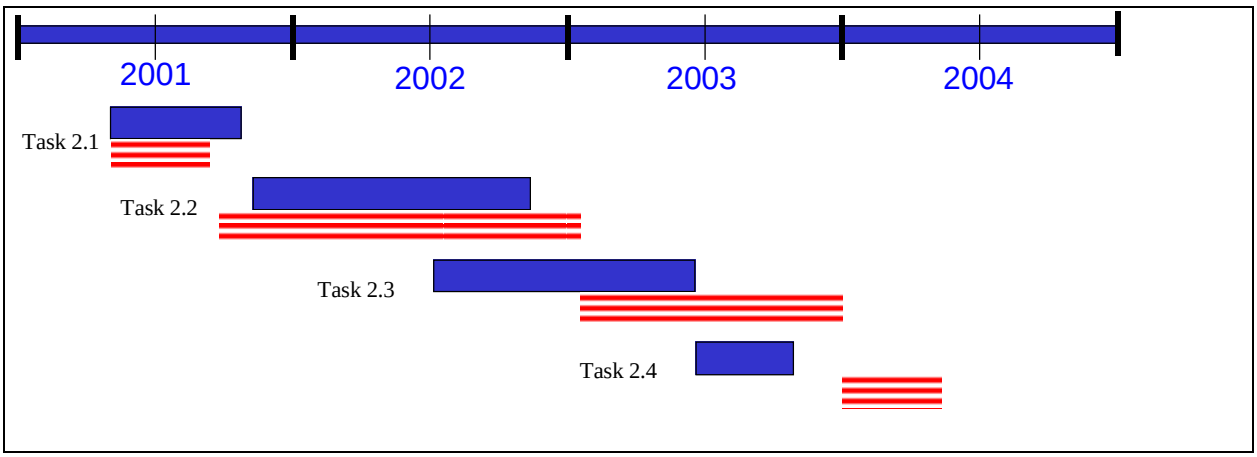
Significant problems or changes
[Describe any significant technical, regulatory or fiscal problems. Request approval for significant changes in work scope, revised milestone due dates, changes in key personnel assigned to the project, changes in match funds, changes to permits, or reallocation of budget cost categories. If none, include the following statement: "Progress and expenditures will result in project being completed on time and within budget."]

What we expect to accomplish during the next period
[Concise description of major activities and accomplishments expected, by task, deliverable or milestone as appropriate. This will be transferred to the next progress report]]

Status of Milestones and Deliverables:

[This should be the complete list as contained in the Scope of Work and the attached Schedule of Deliverables. Highlight differences between actual and planned.]

Description	Start Date		Due Date		Status (%)
	Planned	Actual	Planned	Actual	
Deliverable 1	DATE	DATE	DATE	DATE	Ontime 100%
Deliverable 2	DATE	**DATE**	DATE	**DATE**	**Ahead 100%**
Deliverable 3	DATE	**DATE**	DATE	**DATE**	**Delayed 25%**



Overall schedule for the _____ project.
[Planned is solid blue, actual is red striped. This work flow diagram needs to correlate with the schedule in Exhibit B. This example has been prepared as a Word Picture, but a comparable Excel diagram or Gantt chart is fine.]

Overview of Fiscal Status: (See invoices for detail.)
It is useful to track the rate of expenditure of project funds. The most useful way to do this is to compare the actual expenditure rate with the planned expenditure rate. You get the planned rate at the beginning of the project, so it becomes a baseline. If you change course at a critical project review, you should show the original and the modified baseline, and then track against the new one.

Photographs:
Include photographs where appropriate to document progress. The photos shall be shot with color print film or be very high quality digital photos (at least 300 dpi).]

Evidence of Progress:
If there is a long time between interim deliverables, then attach evidence of the progress being made (e.g., test data, product mock-ups, field site descriptions, preliminary analyses) to the Progress Reports to allow the Commission Contract Manager to review contract progress and gauge the quality of research results.

Notes:
The tracking for tasks and money is generally done at the major task level, but this depends on the project and fiscal controls.

Notice that there is no technical detail in these reports. This should come in specific deliverables so that critical project management information doesn't get lost. If the contractor is reporting monthly, but submitting invoices quarterly, then use the three monthly reports as an equivalent quarterly report. Don't make them write another report just to get paid.

The progress report on each project should be 1-2 pages long (plus photographs) and take about 1 hour to prepare for each reporting period.

Exhibit (A-3)

Final Report Instructions

1. Please contact Susan Patterson (916) 654-4992, spatters@energy.state.ca.us of the PIER Technology Transfer Group before preparing the outline of your final report. She will explain the process and go over any questions you have. It is best if both the Contractor and the Commission Contract Manager participate in this discussion.

2. Please use the MS Office Suite for your final reports. The version currently in use at the Commission is "97" operating on Windows 98. Please let us know if significant portions of the report will be in other programs.

3. When the Contractor and the Commission Contract Manager have agreed to the Draft Final Report, the Commission Contract Manager forwards the electronic report file(s) to Susan Patterson.

4. Susan forwards these electronic report file(s)to Heather Roberts, the SAIC Editing Coordinator, and to Julie Talbert, who will log the report into the Technology Transfer Group's work order system (internal e-mail address: ***Tech Trans***) for tracking purposes.

5. Julie requests a publication number from Business Services and provides it to Susan and Heather

6. In about a week, Heather will schedule a teleconference with the Commission Contract Manager, the report's author, and Susan Patterson. The day before the teleconference, Heather will send all teleconference participants a PDF version of the report and a list of the sections to discuss and resolve in the teleconference (i.e., Executive Summary, Objectives, Outcomes, Conclusions, Benefits to California, Recommendations, Abstract).

7. During the teleconference, which is scheduled for two hours but usually takes less, the participants will walk through the Executive Summary to ensure that the goals, objectives, outcomes, conclusions and recommendations of the project are presented in a consistent and intelligible fashion. The Executive Summary is the primary focus of the teleconference. Editorial and format changes for the entire report will be discussed and agreed upon by all participants. We will also identify any missing elements and who is responsible for filling them. Before concluding the teleconference, the participants will develop a schedule for completing the edits to the report.

8. SAIC is responsible for collecting and incorporating all missing elements and comments into the Final Report. Typically this takes place during the week following the teleconference, but may take longer, depending on the schedule developed during the teleconference.

9. When the edits are complete, SAIC will notify all participants that the report is posted on **SAIC's PIER Website *http://pier.saic.com*** and is available for a final review by all.

10. If there are additional changes, those should be brought to Heather's attention directly with a "cc:" to all of the participants in the teleconference. Once the report is agreeable to all, the Commission Contract Manager will send written approval to the Contractor, who will submit 1 bound copy with their final invoice. At the same time, the Commission Contract Manager will notify Heather, who will send Susan 1 unbound master copy and forward the approved PDF to Bob Aldrich in the Commission's Media and Public Communications Office for posting on the Commission's PIER Website.

Final Report Contents

PIER Final Reports contain the following sections:

Cover Page and Title Page
Legal Notice
Acknowledgement Page
Table of Contents
Preface
Executive Summary
Abstract
Introduction
Project Approach
Project Outcomes
Conclusions and Recommendations
Endnotes
References
Glossary
Appendices
Attachments

Cover Page and Title Page

Please create one page with the following information. It will be used to create the cover and title pages.

- Title of the Report
- Name of primary author(s) or principal investigator
- Author's company, organization or affiliation
- Location of author's company, organization or affiliation (City, State)
- Name of Energy Commission Project Manager
- PIER Program Area
- PIER Program Area Lead
- Contract Number
- Amount of Contract (Total including amendments.)
- Publication Number (Ask Susan Patterson, (916) 654-4992 for this number.)
- Publication Date (Month and Year. Verify with Susan Patterson.)

Legal Notice

Use the following notice:

Legal Notice

This report was prepared as a result of work sponsored by the California Energy Commission (Commission, Energy Commission). It does not necessarily represent the views of the Commission, its employees, or the State of California. The Commission, the State of California, its employees, contractors, and subcontractors make no warranty, express or implied, and assume no legal liability for the information in this report; nor does any party represent that the use of this information will not infringe upon privately owned rights. This report has not been approved or disapproved by the Commission nor has the Commission passed upon the accuracy or adequacy of this information in this report.

NOTE: The abbreviation "CEC" is not allowed in final reports. Chose either Commission or Energy Commission throughout the report. Be consistent with one of the choices, and use it throughout the report.

Acknowledgement Page

This is the place for the author or principal investigator to acknowledge or express appreciation to those who participated in the project. This may be a paragraph, or a list of names, and if appropriate their affiliations.

Table of Contents

Sections to be included in the Table of Contents are as follows:

Preface

Executive Summary

Abstract

1. Introduction
   - Background and Overview (Why this project was necessary)
   - Project Objectives (What you planned to accomplish)
   - Report Organization

2. Project Approach (What you did to accomplish your objectives)

3. Project Outcomes (What happened)

4. Conclusions and Recommendations
   - Conclusions (What you learned from what happened)
   - Commercialization Potential
   - Recommendations (What you think should occur next)
   - Benefits to California

Endnotes

References

Glossary

List of Figures

List of Tables

Appendices

Attachments

Preface

Fill in the contract name, contract number, report title, organization, and research area, and numbers in the second to the last paragraph. Use the following Preface:

Preface

The Public Interest Energy Research (PIER) Program supports public interest energy research and development that will help improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

The PIER Program, managed by the California Energy Commission (Commission), annually awards up to $62 million to conduct the most promising public interest energy research by partnering with Research, Development, and Demonstration (RD&D) organizations, including individuals, businesses, utilities, and public or private research institutions.

PIER funding efforts are focused on the following six RD&D program areas:

Buildings End-Use Energy Efficiency

Industrial/Agricultural/Water End-Use Energy Efficiency

Renewable Energy

Environmentally-Preferred Advanced Generation

Energy-Related Environmental Research

Strategic Energy Research.

What follows is the final report for the **[Contract Name,] [Contract Number,]** conducted by the **[Company/Organization/Affiliation]**. The report is entitled **[Report Title]**. This project contributes to the **[PIER Program Area]** program.

For more information on the PIER Program, please visit the Commission's Web site at: http://www.energy.ca.gov/research/index.html or contact the Commission's Publications Unit at 916-654-5200.

Executive Summary

A final report in miniature, containing all key information. Summarizes the introduction, purpose, project objectives, project outcomes, conclusions, recommendations and Benefits to California. It is intended to be short, bullet formatting is suggested. Assume a non-technical, management-level readership. You may want to write this as if you will hand it out at a trade show. Emphasize the benefits of the project and include who should care and why. Put on the hat of an inquisitive, reasonably well-educated lay reader who may be interested in purchasing or implementing the subject technology. Pretend that they just paid for this research project and they want to understand how and why you spent their money.

If your project has more than one project, repeat this organization for each project area. The Executive Summary needs to summarize the report, not present new information found nowhere else in the document. Go the Commission web site for further examples.

Abstract

This section should be the technical counterpart to the executive summary. Less marketing and sales oriented than the Executive Summary. This should be similar to what you would find in a technical trade periodical. Limited to 250 words, essentially a very brief, Executive Summary.

The Abstract covers the purpose, objectives, outcomes and conclusions. Contains 5-10 keywords for computer searches. Geared toward a more technical audience.

Introduction

- Background and Overview (Why this project was necessary) - Provide relevant background, identify this project's subject area and the goals of this research. Use Stages and Gates terminology, where appropriate, to identify what stage the project has reached in its path to market. Refer to the contract for this information.
- Project Objectives (What you planned to accomplish) - Present the technical and economic objectives for your project. The objectives need to contain the way(s) to measure or know the success of having reached the objective. Use Stages and Gates terminology where appropriate. These should be taken from the contract and should reflect any changes made during critical project reviews or at other times during the course of the project. (Describe why these changes were made in the Project Approach section.)

  Each objective shall be separately identified, a useful form is:

  Project objectives were to:
  - Verify (an action verb followed by relevant text)….
  - Determine….
  - Measure…
  - Develop….
- Report Organization – Provides a roadmap to the rest of the report. If there are separate final reports for a multitasked project, set the context in Background section and refer the reader to their location here.

Project Approach

This section discusses the tasks you undertook and your approach to the research (What you did to accomplish your objectives). Discuss the testing procedures you undertook and the system modifications and improvements you made.

Project Outcomes

This is where you present your results (What happened). Organize this section so that results are presented in the same order as the objectives. A short version of each Outcome should be stated in bullet form. Supporting paragraphs that describe each Outcome should follow each bullet.

There can be more Outcomes than there were Objectives. For example, there may be more than one Outcome per Objective. It is also possible to have an unanticipated Outcome during your research. However, you can not have stranded objectives; all Objectives, whether met or not, must be discussed in this section. If this section is particularly long, then it is useful to create a summary at the end of this section where all of the bullets are drawn together as a summary.

Conclusions and Recommendations

- Conclusions (What you learned from what happened) - Organize the Conclusions in the same order as Objectives and Outcomes. You may have Conclusions that are broader than individual Objectives and Outcomes. Please present these after you present the individual Conclusions. Conclusions must be drawn from evidence presented in the report.

- Commercialization Potential - This is where you should directly address stages and gates. Explain where your project is in stages and gates. If your project had a task to prepare a Production Readiness

Plan or a similar effort related to assessing where the research is in relationship to being used in its relevant markets (i.e. Stages and Gates), this is the place to discuss that task.

- Recommendations (What you think should occur next) - Recommendations should derive from the Conclusions presented. Recommendations specific to individual Objectives, Outcomes and Conclusions should be presented in the original order. General Recommendations should follow. Use Stages and Gates terminology where appropriate. What is the next stage for this project?

- Benefits to California - This section discussed two issues: (1) what benefits has California already received from this contract, if applicable, and (2) if this project is successful and the results widely used, how will California benefit. These benefits need to be related to the problems this research was intended to address. Refer to the Introduction section of the report.

Endnotes
Endnotes are preferred to footnotes.

Glossary
If there are more than 10 acronyms then a glossary with definitions for each acronym should be provided at the end of the report.

References
This is where you list all documents referred to in the body of the report. List references in standard bibliographic format. Be sure to check that shorthand references contained in the body of the report are accurate. Any documents referred to in the Appendices should be listed in the reference section in the appropriate Appendix.

Appendices
Designated by Roman numerals.

Attachments
If absolutely required, designated by Roman numerals.

Here is some additional guidance on how to ensure that the reports are technically accurate and internally consistent:

1. Put on the hat of an inquisitive, reasonably well-educated lay reader. Pretend that they just paid for this research project and they want to understand how and why you spent their money.
2. Apply the test of completeness. Are all the pieces there? Are all the references clear and do those in the text match those in the reference section? Are the relationships between the partners and the players clearly explained?
3. Apply the test of logic. Does the document flow and make sense? Is the need for the research clearly described? Is the technical approach clearly described? Do the conclusions make sense? Are they drawn from the analysis? Do the numbers check? Is it clear how the numbers were derived?
4. If the project didn't do everything it intended to do, explain.
5. The final report must primarily address the contract work statement. Doing this will help manage the scope and the effort required for this report. A) Some research projects are Stage X (e.g. one stage of stages and gates) of a longer-term program and all work done during the time the Commission was involved was funded by all of the partners. B) In other cases, the work being done in this Stage of the program had more tasks than the Commission participated in, although some of the results of this work may have impacted, or been impacted by the other tasks. The Commission funded portion of the research project (or program) needs to be clearly differentiated from the overall program of which this portion of the research is a part. Comments about the program should not be intermingled with those about the project.
6. The objectives of the research project need to be clearly stated. The objectives of the Commission funded research project need to be clearly differentiated from the objectives of the overall program of which the research is a part. The objectives of the program should not be intermingled with the objectives of the project. If some objectives of the program will be performed elsewhere, or at another time, this needs to be explained. The report should then stay focused on the objectives of this project.
7. There needs to be a clear relationship between the objectives and the outcomes. The outcomes of the Commission funded research project need to be clearly differentiated from the outcomes of the overall program of which the research is a part. The outcomes of the program should not be intermingled with the outcomes of the project.
8. The methods used to conduct the research need to be explained.
9. Data that is presented in the report needs to be analyzed. If you present a picture, graph or table, be sure that you discuss it in the text, not just refer to it.
10. Each conclusion needs to be substantiated by the analysis contained in the report.
11. Figures and Tables must clearly relate to, and be consistent with the text, and vice versa. (If the text says the generator had a capacity of 30 kW, the table shouldn't say it was 31.2 kW.)
12. Use consistent references to report performance specifications and results. For example, if a piece of equipment is to be referred to by its nominal nameplate rating then use that reference consistently throughout the report. If however the desired number was the measured performance of the device, (almost always different from nameplate) then consistently use that measured number. Do not mix the two in the narrative.
13. The text needs to clearly refer to the attached appendices. It should also explain how the data in the appendices matters to the text. If it doesn't really matter, it probably should be dropped. (You may still need it because it is a deliverable according to the contract, so check this carefully.) References to multi-page appendices need to be specific to the page or section of the appendix, not just a general reference to Appendix X.

(Exhibit A-4)

Sample Subaward including Terms & Conditions for PIER-EA awards under 500-02-004

SUBAWARD NO. INPUT
between
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, OFFICE OF THE PRESIDENT
and
INPUT

This Subaward is between the Regents of the University of California, (The Regents) Office of the President on behalf of the California Institute of Energy Efficiency (OP/CIEE) and INPUT (Institution).

Whereas, the State Energy Resources Conservation and Development Commission (Commission) is responsible for implementing the Public Interest Energy Research (PIER) Program; and

Whereas, OP/CIEE has entered into Agreement 500-02-004 with the Commission to fund research, development and demonstration awards for the Public Interest Energy Research (PIER) Program; and

Whereas, Institution's proposal has been selected for conducting research or other activities contributing to the Commission's mission and to the purposes of the prime contract;

NOW THEREFORE, the parties mutually agree as follows:

1. SCOPE OF WORK

Institution shall exercise its best efforts to carry out the program indicated in the Scope of Work Exhibit A, which is incorporated herein and made part of this Subaward. The Scope of Work may be modified only by mutual written agreement. Significant changes to the Scope of Work must be approved by OP/CIEE and the Commission by amendment.

2. PERIOD OF PERFORMANCE

The period of performance shall be from INPUT through INPUT. These dates are subject to the Commission's continued support of OP/CIEE.

3. BUDGET

The total amount of funds made available and reimbursable under this Subaward shall not exceed $INPUT in accordance with the approved budget in Exhibit B.

4. PAYMENTS

A. OP/CIEE shall provide monthly payments in arrears upon receipt of an itemized invoice for actual costs. The invoice format with required cost elements is contained in the Exhibit B Budget workbook. Invoices shall be sent to:

California Institute for Energy Efficiency
Brad Niess, Subcontract Specialist
1333 Broadway, Suite 240
Oakland, CA 94612-1918
Tel: (510) 287-3326
Fax: (510) 287-3328

OP/CIEE can only process a payment request if all required deliverables and reports have been submitted and are in accordance with Article 8. Report Requirements. The final request for reimbursement

must be received by OP/CIEE no later than sixty (60) calendar days after the Subaward end date. The Subaward will be considered paid in full sixty (60) days after the end date.

3. Allowable costs shall be determined in accordance with OMB Circular A-21, "Cost Principles Applicable to Grants, Contracts and Other Agreements with Institutions of Higher Education," incorporated by reference as part of this Subaward.

C. Items included in the Exhibit B budget are considered approved. Institution may reallocate up to a cumulative amount of fifteen percent (15%) of the total amount of the Subaward or $5,000, which ever is greater. Written notification of any such changes must be provided in the current progress report. Proposed budget changes which exceed the cumulative total of more than 15% or $5,000 require the prior written approval of OP/CIEE.

D. Title to any equipment purchased with Subaward funds vests with the Regents of the University of California, and may be used in the project or program for which it was acquired as long as needed. When the equipment is no longer needed for the original project, Institution shall contact OP/CIEE for disposition instructions. If no disposition instructions are provided within 120 days after completion of the Subaward, the Institution shall have no further obligation to OP/CIEE regarding such equipment.

Unless specifically approved by OP/CIEE, funds are not authorized for purchase of general-purpose software or equipment, including computers, typewriters, word processors, duplication devices, and telecommunication devices.

E. 10% of the total Subaward amount shall be retained by OP/CIEE and released to Institution only upon the Commission's approval that the work under this Subaward has been satisfactorily completed, and the Final Report has been received and accepted.

5. PROJECT MANAGEMENT

nstitution's Principal Investigator (PI) INPUT is responsible for Institution's portion of the research and is considered Key Personnel. No substitution may be made of Institution's PI without OP/CIEE's prior written approval.

OP/CIEE's Principal Investigator Carl Blumstein is responsible for the overall conduct of the project.

OP/CIEE Project Manager Edward Vine is responsible for technical monitoring and guidance, reviewing reports and deliverables, and acting as liaison between the Institution's PI and the Commission.

The CEC Project Manager INPUT is responsible for reviewing reports and deliverables, providing guidance and feedback to the Institution's PI and OP/CIEE, and determining whether the project met the Commission's objectives.

6. STANDARDS OF PERFORMANCE

nstitution personnel and any lower-tier subcontractors performing work under this Subaward shall be responsible for exercising the degree of skill and care required by customarily accepted good professional practices and procedures used in scientific and engineering research fields.

The failure of a project to achieve the technical or economic goals stated in the Scope of Work is not a basis for OP/CIEE or the Commission to determine that the work is unacceptable, unless the work conducted by the nstitution is deemed by OP/CIEE or the Commission to have failed the foregoing standard of performance.

n the event that Institution fails to perform in accordance with the foregoing standard, OP/CIEE and the Commission shall seek to negotiate in good faith an equitable resolution satisfactory to both parties. If such

esolution cannot be reached, the parties shall work through the dispute resolution process described in Article 15. Disputes herein.

7. SUBCONTRACTORS

Except for Subcontractors identified in the approved budget, Institution shall not subcontract or assign any part of he Scope of Work without prior written approval by OP/CIEE. Institution shall require its lower tier subcontractors o comply with the terms and conditions contained herein.

8. REPORT REQUIREMENTS

n addition to any specific deliverables described in the Scope of Work, Exhibit A, required deliverables under this Subaward consist of quarterly Progress Reports, the Final Report, and 2-page Final Project Summary. All leliverables shall be sent to the CIEE Sr. Subcontract Analyst with a copy to the Commission Project Manager. Each quarterly Progress Report is due within 10 business days after the end of the reporting period. The required content and format of Progress Reports is described in Exhibit A-2. The Final Report shall be submitted no later han 15 business days prior to the end of the performance period. The Final Report requirements are incorporated as Exhibit A-3.

9. CONFIDENTIALITY

No confidential deliverables are anticipated under this Subaward. All products including, but not limited to, Progress Reports, task products, and the Final Report shall not contain confidential information except when the Commission Contract Manager and OP/CIEE deem it necessary to include confidential information in a product. In such event, Institution shall prepare the deliverable in two separate volumes: one for public distribution and one to be maintained in the Commission's confidential records.

10. INTELLECTUAL PROPERTY DEVELOPED PRIOR TO THIS SUBAWARD

The Commission makes no claim to intellectual property that existed prior to this Subaward and was developed without Commission funding. Each Scope of Work shall identify any applicable pre-existing intellectual property.

11. INTELLECTUAL PROPERTY

A. Commission and OP/CIEE's Rights in Deliverables

Deliverables and reports specified for delivery to the Commission and OP/CIEE under this Subaward shall become the property of the Commission and OP/CIEE. The Commission and OP/CIEE may use, publish, and reproduce the deliverables and reports subject to the provisions of Paragraph C.

B. Rights in Technical, Generated, and Deliverable Data

1) Institution's Rights

Data (technical, generated and deliverable) produced under this Subaward shall be the property of Institution, limited by the license retained by the Commission and OP/CIEE in (2) below, and the rights the Commission has in deliverables specified above in Paragraph A.

2) Commission and OP/CIEE Rights

Institution shall provide the Commission Contract Manager and OP/CIEE Sr. Subcontract Analyst with a copy of all technical, generated and deliverable data produced under the Subaward, when requested.

Institution is not required to copy and submit data that the Commission Contract Manager has identified as being unusable to the Commission and the PIER program. As an example, some data may not warrant routine copying and shipping because this raw data is too disaggregated or voluminous for practical application. Retention of such data at Institution's facility for inspection, review and possible copying by the Commission Contract Manager is appropriate. However, upon

request by the Commission, Institution shall provide the Commission access to review technical and generated data produced in the course of this Subaward that is not requested to be delivered.

For all data (technical, generated and deliverable) produced under this Subaward, the Commission and OP/CIEE retain a no-cost, non-exclusive, non-transferable, irrevocable, royalty-free, worldwide, perpetual license to use, publish, translate, produce and to authorize others to produce, translate, publish and use the data, subject to the provisions of Paragraph C.

C. Limitations on Commission Disclosure of Institution's Confidential Information

1) Data provided to the Commission by Institution, which data the Commission has not already designated as confidential and which Institution seeks to have designated as confidential, or is the subject of a pending application of confidentiality, shall not be disclosed by the Commission except as provided in Title 20 CCR Sections 2505 and following (and amendments), unless disclosure is ordered by a Court of competent jurisdiction.

2) It is the Commission's intent to use and release project results such as deliverables and data in a manner calculated to further PIER while protecting proprietary or patentable interests of the parties. Therefore, the Commission agrees not to disclose confidential data or the contents of reports containing data considered by Institution as confidential, without first providing a copy of the disclosure document for review and comment by Institution. Institution shall have no less than 10 business days for review and comment and, if appropriate, to make an application for confidential designation pursuant to Title 20 CCR Sections 2505 and following (and amendments) on some or all of the data. The Commission shall consider the comments of Institution and use professional judgment in revising the report, information or data accordingly.

D. Exclusive Remedy

In the event the Commission intends to publish or has disclosed data that Institution considers confidential, Institution' exclusive remedy is a civil court action for injunctive relief. Such court action shall be filed in Sacramento County, Sacramento, California.

E. Waiver of Consequential Damages

In no event will the Commission be liable for any special, incidental, or consequential damages based on breach of warranty, breach of contract, negligence, strict tort, or any other legal theory for the disclosure of confidential information or information that Institution considers confidential, even if the Commission has been advised of the possibility of such damage.

Damages that the Commission will not be responsible for include, but are not limited to, loss of profit; loss of savings or revenue; loss of goodwill; loss of use of the product or any associated equipment; cost of capital; cost of any substitute equipment, facilities, or services; downtime; the claims of third parties including customers; and injury to property.

F. Limitations on Institution Disclosure of Subaward Data, Information, Reports and Records

1) Institution will not disclose the contents of the Final or any preliminary deliverable or report without first providing a copy of the disclosure document for review and comment to the Commission Contract Manager. Institution shall consider the comments of the Commission Contract Manager and use professional judgment in revising the reports, information or data accordingly.

2) After any document submitted has become a part of the public records of the State, Institution may, if it wishes to do so at its own expense, publish or utilize the same, but shall include the legal notice and copyright information as applicable.

3) Notwithstanding the foregoing, in the event any public statement is made by the Commission as to the role of Institution or the content of any preliminary or Final Report of Institution hereunder, Institution may, if it believes such statement to be incorrect, state publicly what it believes is correct.

4) No record that is provided by the Commission to Institution for Institution's use in executing this Subaward and which has been designated as confidential, or is the subject of a pending Application for Confidential Designation, except as provided in Title 20, California Code of Regulations (CCR), section 2505 and following (and amendments), shall be disclosed, unless disclosure is ordered by a court of competent jurisdiction. At the election of the Commission Contract Manager, Institution, Institution' employees and any Institution shall execute a "Confidentiality Agreement," supplied by the Commission Contract Manager.

5) Institution acknowledges that each of its officers, employees, and Institutions who are involved in the performance of this Subaward will be informed about the restrictions contained herein and to abide by the above terms.

G. Proprietary Data

Proprietary data owned by Institution shall remain with Institution throughout the term of this Subaward and thereafter. The extent of Commission's access to the same and the testimony available regarding the same shall be limited to that reasonably necessary to demonstrate, in a scientific manner to the satisfaction of scientific persons, the validity of any premise, postulate or conclusion referred to or expressed in any deliverable hereunder.

H. Preservation of Data

Any data which is reserved to Institution by the express terms hereof, and pre-existing proprietary or confidential data which has been utilized to support any premise, postulate or conclusion referred to or expressed in any deliverable hereunder, shall be preserved by Institution at Institution's own expense for a period of not less than three (3) years after final payment, unless a longer period of record retention is stipulated.

I. Destruction of Data

Before the expiration of three (3) years and before changing the form of or destroying any data, including technical, generated, deliverable proprietary data or trade secrets, Institution shall notify Commission of any such contemplated action and Commission may, within thirty (30) days after said notification, determine whether it desires said data to be further preserved. If Commission so elects, the expense of further preserving said data shall be paid for by the Commission. Institution agrees that Commission may at its own expense, have reasonable access to said data throughout the time during which said data is preserved. Institution agrees to use its best efforts to identify competent witnesses to testify in any court of law regarding said data or, at Commission's expense, to furnish such competent witnesses.

J. Patent Rights

1) Patent rights for any Subject Invention, whether actually patented or unpatented, will be the property of Institution whose employees or researchers are inventors of such invention pursuant to U.S. patent law, subject to the Commission obtaining a no-cost, nonexclusive, nontransferable, irrevocable, perpetual, royalty-free, worldwide license to use or have practiced such rights for or on behalf of the State of California for governmental purposes. Commission shall not purposefully enter into competition with a Licensee or take affirmative actions intended to effectively destroy the commercial market where a Licensee has introduced a Licensed Product. Institution must obtain agreements to effectuate this clause with all persons or entities, except for the U.S. Department of Energy (DOE; as other rights apply), obtaining ownership interest in such patent rights. Previously

documented (whether patented or unpatented under the patent laws of the United States of America or any foreign country) inventions are exempt from this provision.

2) Institution will disclose to OP/CIEE on a confidential basis all Subject Inventions. Institution shall send, by March 1 of each year, a report to OP/CIEE that provides non-proprietary information on the status of any patents and/or licensing agreements executed or under negotiation for Subject Inventions and/or activities by Licensee related to the development and testing of Licensed Product. OP/CIEE will forward this report to the Commission. The Commission may provide any suggestions to Institution concerning commercialization strategies and/or potential licensees for such invention within sixty (60) days of receiving the disclosure from Institution.

3) March-in Rights. With respect to any Subject Invention in which Institution has acquired title, to the extent permissible under Federal laws and regulations, the Commission shall have the right to require Institution, an assignee or Licensee of such patent rights to grant a nonexclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant, upon terms that are reasonable under the circumstances, and if Institution, assignee, or Licensee refuses such request, to grant such a license itself, if the Commission determines that:

   a) such action is necessary because Institution, Licensee, or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the patent rights in such field of use; or

   b) such action is necessary to alleviate health or safety needs that are not reasonably satisfied by Institution, assignees, or their Licensees.

4) Final resolution, if not resolved under Article 15. Disputes, will be settled in the courts of the State of California. The parties may refer to the Federal Government's procedures for handling march-in rights.

5) Future Reductions. Institution will submit to OP/CIEE in confidence within ninety (90) days after termination or expiration of this Subaward, a report listing inventions that are conceived, but not actually reduced to practice, in the performance of this Subaward. The Commission will identify in writing within sixty (60) days to Institution those conceptions that it desires to reserve rights to should Institution desire to actually reduce to practice those identified conceptions within forty-two (42) months after the termination or expiration of the Subaward. Institution has an affirmative duty to report to OP/CIEE those conceptions reduced to practice within the forty-two (42) month period.

K. Commission's Rights to Invention

Institution and all persons and/or entities obtaining an ownership interest in Subject Invention(s) shall include within the specification of any United States patent application, and any patent issuing thereon covering a Subject Invention, the following statement:

> "This invention was made with State of California support under California Energy Commission Agreement number 500-02-004. The Energy Commission has certain rights to this invention."

L. Commission's Interest in Inventions

Upon the perfecting of a patent application on any Subject Invention, Institution will fill out and sign a Uniform Commercial Code (UCC.1) Financing Statement and submit it the Commission Contract Officer for complete processing. The Commission Contract Officer will review the UCC.1 for complete information and file the completed UCC.1 with the Secretary of State's Office.

M. Copyrights

1) Copyrightable work first produced under this Subaward shall be owned by Institution, limited by the license granted to the Commission in subparagraph 2) below.

2) Institution agrees to grant the Commission a royalty-free, no-cost nonexclusive, irrevocable, nontransferable worldwide, perpetual license to produce, translate, publish, use and dispose of, and to authorize others to produce, translate, publish, use and dispose of all copyrightable work first produced or composed in the performance of this Subaward.

3) Institution will apply copyright notices to all Deliverables using the following form or such other form as may be reasonably specified by Commission:

> ©[Year of first publication of deliverable], [copyright holder]. All Rights Reserved.

4) Software

In the event software that is not a deliverable is developed under the Subaward, Institution shall have the right to copyright and/or patent such software and grants the Commission a royalty-free, no-cost, non-exclusive, irrevocable, non-transferable, world-wide, perpetual license to produce and use for governmental purposes the software, and its derivatives and upgrades that may be developed by the authors within 42 months following the termination or expiration of this Subaward. The Commission shall not purposefully enter into competition with a Licensee or take affirmative actions intended to effectively destroy the commercial market where a Licensee has introduced a licensed product.

N. Intellectual Property Indemnity

Institution will defend and indemnify Commission from and against any claim, lawsuit or other proceeding, loss, cost, liability or expense (including court costs and reasonable fees of attorneys and other professionals) to the extent arising out of any third party claim solely arising out of the negligent or other tortious act(s) or omission(s) by Institution, its employees, or agents, in connection with intellectual property claims against either deliverables or Institution' performance thereof under this Subaward.

12. ROYALTY PAYMENTS TO COMMISSION

Royalty provisions apply for each project funded under this Subaward. These terms apply to both UC and non-UC personnel and performing institutions. These royalty provisions only apply to intellectual property developed under this Subaward. The complete terms on royalty payments to Commission are contained in CEC/UC Research Agreement 500-02-004. A copy of these terms shall be provided to the Institution upon request to OP/CIEE.
Note: This clause is not applicable to awards under PIER-EA Exploratory and Global Climate Change Programs.

13. TERMINATION

A. Default

In the event of any default, the Commission may, without prejudice to any of its other legal remedies, terminate the prime contract upon five (5) calendar days written notice to OP/CIEE. OP/CIEE shall immediately notify Institution.

B. Breach

The OP/CIEE shall provide the Institution written notice of intent to terminate due to Institution's breach. Institution will have 15 calendar days to fully perform or cure the breach. In the event Institution does not cure the breach within 15 days, OP/CIEE may, without prejudice to any of its other remedies, terminate this Subaward upon five (5) calendar days written notice to Institution. In such event, OP/CIEE shall pay Institution only the reasonable value of the work satisfactorily performed, as may be agreed upon by the

parties or determined by a court of law, but not in excess of the maximum amount payable under this Subaward.

C. For Cause

The Commission may, for cause, and at its option, terminate the prime contract upon giving thirty (30)-days' advance written notice to OP/CIEE. OP/CIEE shall immediately notify Institution. In such event, Institution agrees to use all reasonable efforts to mitigate its expenses and obligations.
The term "for cause" includes, but is not limited to, the following reasons:

- Loss of State or Federal funding for this Subaward;
- significant change in State or Commission policy such that the work or product being funded would not be supported by the Commission;
- change in Commission's staffing such that the work or product being funded can be done by staff of the Commission.

C. Allowable Termination Costs

OMB Circular A-21, Section J.49, shall be used to determine allowable termination costs, but ıot in excess of the total amount of this Subaward.

l4. STOP WORK

The Commission Contract Manager may, at any time, by written notice to the OP/CIEE require nstitution to stop or suspend work on all or any part of the Subaward work tasks. OP/CIEE shall mmediately notify Institution.

A. Compliance

Upon receipt of such Stop Work order, Institution shall immediately take all necessary steps to comply therewith and to minimize the incurrence of costs allocable to work stopped.

B. Equitable Adjustment

An equitable adjustment shall be made by the Commission based upon a written request by Institution for an equitable adjustment. Institution must make such adjustment request within thirty (30) days from the date of receipt of the Stop Work notice.

C. Revoking a Stop Work Order

Institution shall resume stopped work only upon receipt of written instructions from OP/CIEE canceling the Stop Work order.

l5. DISPUTES

n the event of a contract dispute or grievance between the Commission Contract Manager and Institution, the ollowing procedure shall be followed by both parties:

A. Commission Dispute Resolution

If a problem cannot be resolved within ten (10) business days between the Commission Contract Manager and the Institution, Institution shall prepare a package in writing stating the issues in the dispute, the legal authority or other basis for Institution' position and the remedy sought. The package must be submitted to the Commission Dispute Resolution Committee. The Committee shall make a determination on the problem within ten (10) business days after receipt of the package. Should Institution disagree with the Committee's decision, Institution may appeal to the full Commission at a regularly scheduled business meeting. The Committee will provide OP/CIEE and Institution with the current procedures for placing the appeal on a Commission Business Meeting Agenda.

Institution shall continue with the responsibilities under this Subaward during any dispute.

B. Binding Arbitration

Should the Commission's Dispute Resolution procedure identified in Paragraph A above fail to resolve a contract dispute or grievance to the satisfaction of OP/CIEE and Institution, OP/CIEE and Institution may elect to have the dispute or grievance resolved through binding arbitration. The Commission may also elect to have any contract dispute or grievance resolved through binding arbitration. Both parties must agree to submit the dispute or grievance to arbitration. The arbitration proceeding shall take place in Sacramento County, California, and shall be governed by the commercial arbitration rules of the American Arbitration Association (AAA) in effect on the date the arbitration is initiated. The dispute or grievance shall be resolved by one (1) arbitrator who is an expert in the particular field of the dispute or grievance. The arbitrator shall be selected in accordance with the aforementioned commercial arbitration rules. The decision rendered by the arbitrator shall be final, and judgment may be entered upon it in accordance with the applicable law in any court having jurisdiction thereof. The demand for arbitration shall be made no later than six (6) months after the date of the contract's termination, irrespective of when the dispute or grievance arose, and irrespective of the applicable statute of limitations for a suit based on the dispute or grievance. If the parties do not mutually agree to arbitration, the parties agree that the forum to resolve a dispute is State court or Federal court, with the exception of Federal bankruptcy court.

The cost of arbitration shall be borne by the parties as follows:

1) The AAA's administrative fees shall be borne equally by the parties;
2) The expense of a stenographer shall be borne by the party requesting a stenographic record;
3) Witness expenses for either side shall be paid by the party producing the witness;
4) Each party shall bear the cost of its own travel expenses;
5) All other expenses shall be borne equally by the parties, unless the arbitrator apportions or assesses the expenses otherwise as part of his or her Subaward.

At the option of the parties, any or all of these arbitration costs may be deducted from any balance of Subaward funds. Both parties must agree, in writing, to utilize Subaward funds to pay for arbitration costs.

16. AUDIT

The Institution performing work under this Subaward agrees that the Commission, the California Department of General Services, the Bureau of State Audits, or their designated representative shall have the right to review and to copy any records and supporting documentation pertaining to the performance of this Subaward if it exceeds $10,000. Institution agrees to maintain such records for possible audit for a minimum of three (3) years after final payment, unless a longer period of record retention is stipulated.

17. INDEMNIFICATION

Institution shall defend, indemnify, and hold The Regents, its officers, employees, and agents harmless from and against any and all liability, loss, expense (including reasonable attorneys' fees), or claims for injury or damages arising out of the performance of this Subaward but only in proportion to and to the extent such liability, loss, expense, attorneys' fees, or claims for injury or damages are caused by or result from the negligent or intentional acts or omissions of Institution, its officers, agents, or employees.

The Regents shall defend, indemnify, and hold Institution, its officers, employees, and agents harmless from and against any and all liability, loss, expense (including reasonable attorneys' fees), or claims for injury or damages arising out of the performance of this Subaward but only in proportion to and to the extent such liability, loss,

expense, attorneys' fees or claims for injury or damages are caused by or result from the negligent or intentional acts or omissions of The Regents, its officers, agents or employees.

18. NONDISCRIMINATION

During the performance of this Subaward, Institution and its Institutions shall not unlawfully discriminate, harass or allow harassment, against any employee or applicant for employment because of sex, sexual orientation, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, and denial of family care leave. Institution and its Institutions shall insure that the evaluation and treatment of their employees and applicants for employment are free of such discrimination and harassment. Institution and its Institutions shall comply with the provisions of the Fair Employment and Housing Act (Government Code Sections 12990 et seq.) and the applicable regulations promulgated thereunder (California Code of Regulations, Title 2, Section 7285.0 et seq.). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code Section 12990 (a-f), set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulations are incorporated into this Subaward by reference and made a part of it as if set forth in full. Institution and its Institutions shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other Subaward.

IF INSURANCE REQUIREMENT IS WAIVED, USE THIS ARTICLE:

19. INSURANCE

The Institution, at its sole cost and expense, shall insure its activities in connection with this Subaward and obtain, keep in force and maintain insurance as follows:

A. Comprehensive or Commercial Form General Liability Insurance requirement: if Institution already has professional liability insurance in place, OP/CIEE will accept the existing coverage limits. If Institution does not have professional liability insurance coverage, OP/CIEE will waive the requirement for this project only.

B. Business Automobile Liability Insurance for owned, scheduled, non-owned, or hired automobiles with a per person limit of not less than $100,000 and a total limit per accident of not less than $300,000, when using automobiles in conducting research under this Subaward.

IF INSURANCE REQUIREMENT IS *NOT* WAIVED, USE THIS ARTICLE:

19. INSURANCE

The Institution, at its sole cost and expense, shall insure its activities in connection with this Subaward and obtain, keep in force and maintain insurance as follows:

A. Commercial Form General Liability Insurance (contractual liability included) with limits as follows:

1) Each Occurrence: $1,000,000
2) Personal and Advertising Injury: $1,000,000
3) General Aggregate: $3,000,000

If the above insurance is written on a claims-made form, it shall continue for three (3) years following termination of this Subaward. The insurance shall have a retroactive date of placement prior to or coinciding with the effective date of this Subaward.

B. Business Automobile Liability Insurance for owned, scheduled, non-owned, or hired automobiles with a combined single limit no less than one million dollars ($1,000,000) per occurrence if using automobiles in conducting research under this Subaward.

C. Workers' Compensation as required under California State law.

D. Professional Medical and Hospital Liability Insurance (contractual liability included) with limits of two million dollars ($2,000,000) per occurrence and five million dollars ($5,000,000) general aggregate.

If the above insurance is written on a claims-made form, it shall continue for three (3) years following termination of this Subaward. The insurance shall have a retroactive date of placement prior to or coinciding with the effective date of this Subaward.

Note: Professional Medical and Hospital Liability Insurance is required only when health care professionals and/or health care students are involved in patient care under this Subaward.

E. Commercial Blanket Bond with a limit no less than the amount of grant funds provided by this Subaward in Institution's possession at any one time covering all employees of Institution, including coverage to protect money and securities as found in a Comprehensive Crime Policy.

F. Such other insurance in such amounts which from time to time may be reasonably required by the mutual consent of The Regents and the

Institution against other insurable risks relating to performance of the Subaward.

G. The coverages required under this Article shall not in any way limit the liability of the Institution.

H. The coverages referred to under Paragraphs A and B shall be endorsed to include The Regents as an additional insured. Such a provision, however, shall apply only in proportion to and to the extent of the negligent acts or omissions of Institution, its officers, employees, and agents. A thirty (30)-day advance written notice (10 days for non-payment of premium) to The Regents of any modification, change or cancellation of any of the above insurance coverages is required.

20. USE OF NAME

Use of the California Institute for Energy Efficiency (OP/CIEE) name in publications, news releases, advertising, speeches, technical papers, photographs and other releases of information regarding this undertaking or data developed hereunder may not be made except upon prior written approval from the OP/CIEE, or except for purposes of support acknowledgement. In any written release of information, Institution shall use the Legal Notice given in Exhibit A-3, Final Report Instructions.

21. INDEPENDENT CONTRACTOR

Institution and its employees, consultants, agents, or independent contractors will perform all services under this Subaward as independent contractors. Nothing in this Subaward will be deemed to create an employer-employee or principal-agent relationship between OP/CIEE and Institution's employees, consultants, agents, or independent contractors. Institution and its employees, consultants, agents and lower tier Institutions will not, by virtue of any services provided under this Subaward, be entitled to participate, as an employee or otherwise, in or under any employee benefit plan of California or any other employment right or benefit available to or enjoyed by employees of California.

22. CHANGES AND AMENDMENTS

All requests for amendments or modifications must be submitted to the OP/CIEE Sr. Subcontract Analyst for approval.

23. AUTHORIZED PERSONNEL

The following individual is authorized to negotiate, modify, terminate, and administer this Subaward:

OP/CIEE :

John Snyder, Sr. Subcontract Analyst
University of California, Office of the President
California Institute for Energy Efficiency
1333 Broadway, Suite 240
Oakland, CA 94612-1918
E-mail: John.Snyder@ucop.edu
Phone: (510) 287-3322
Fax: (510) 287-3328

The following individual is authorized within the Scope of Work to provide technical direction or request supporting services for OP/CIEE:

OP/CIEE Project Manager:

Edward Vine
University of California, Office of the President
California Institute for Energy Efficiency
1333 Broadway, Suite 240
Oakland, CA 94612-1918
Phone: (510) 287-3320
Fax: (510) 287-3328

24. INTEGRATION

This Subaward states the entire contract between the parties in respect to the subject matter of the Subaward and supersedes any previous written or oral representations, statements, negotiations, or agreements. This Subaward may be modified only by written agreement executed by authorized representatives of both parties.

N WITNESS WHEREOF, the parties hereto have caused this Subaward to be executed by their duly authorized epresentatives.

FOR INSTITUTION

By:_____
Signature

_____
Typed Name

_____
Title

_____
Date Signed

FOR OP/CIEE

By:_____
Signature

_____
Typed Name

_____
Title

_____
Date Signed